UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

F/M11:RBG

SEP 2 1983

TO: Distribution*

FROM: F/M11 - William P. Jensen

SUBJECT: Secretarial Review of Final Package for Amendment 6 to the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan

Attached for your review and comment is the final package for Amendment 6 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (FMP). The package consists of the amendment and associated environment assessment, regulatory impact review/initial regulatory flexibility analysis, and draft preamble and proposed regulations. The notice of availability that was also submitted is being finalized and filed at the Office of the Federal Register on September 6, 1983. For information purposes, I am including the Council's letter submitting this package for Secretarial review, and a letter from the State of Alaska containing a determination of consistency with the Alaska Coastal Zone Management Program.

The amendment and other documents were prepared by the North Pacific Fishery Management Council and submitted for review, approval, and implementation under the revised and accelerated procedures established by the 1983 amendment to the Magnuson Fishery Conservation and Management Act. We received this package on August 23, 1983.

After examining the amendment and associated documents, we decided on September 2, 1983, that the amendment package is "structurally complete", i.e., acceptable for review. Accordingly, Secretarial review begins Monday, September 5, 1983. This is termed the "receipt date" or Day 1 under the new procedures. The proposed regulations, with changes made by NMFS as necessary, must be filed with the Office of the Federal Register by the 30th day after the receipt date (i.e., October 4). The Permits and Regulations Division (F/M12 - Donna Turgeon) will be coordinating the review of the proposed and final regulations.

Please direct your comments (including "no comment") on the FMP and related documents (other than regulations) to the attention of Robert Gorrell, F/M11 (634-7449) by COB October 3, 1983. Your individual comments will be forwarded to the Regional Director for his consideration in preparing the draft approval/disapproval memorandum. That memorandum will be the focus for the decision meeting.

Attachments

F/M - Fricke

*Distribution

F/M1 - Finch, Terbush, Fricke
F/M11 - Gorrell, Surdi, Jensen, Martenson
F/M12 - Clem/Turgeon
F/Mx1 - Allen
F/PP - Blatt, Czerwonky
F/M2
F/M21 - Hutchinson
F/M3 - Reifsnyder
F/M41
F/M42 - Rubelman
F/S1
F/S2 - Wheeland
F/S21 - Thompson/Holliday
F/S3
PP2 - Bigford
N/ORM4 - Evans
GCF - Luipold, Fitch
F/AKR -(without attachments)

cc: F/M11(2)
F/M11:NMFS:RBGorrell:634-7449:9/2/83:rg (f)

North Pacific Fishery Management Council

Clement V. Tillion, Chairman
Jim H. Branson, Executive Director

605 West 4th Avenue
Anchorage, Alaska 99510

Mailing Address: P.O. Box 103136
Anchorage, Alaska 99510

Telephone: (907) 274-4563
FTS 271-4064

August 19, 1983

Mr. William G. Gordon
Asst. Adminstrator for Fisheries
National Marine Fisheries Service
3300 Whitehaven, Page 2
Washington, DC 20235

Dear Bill:

Here is Amendment 6 to the fishery management plan for groundfish of the Bering Sea/Aleutian Islands region. Amendment 6 will create a fishery development zone (FDZ) north of Unimak Pass in the Bering Sea for exclusive use by domestic fishermen. All foreign fishing will be excluded from the FDZ. Foreign processing of fish delivered by U.S. fishermen (joint venture) will continue to be allowed.

The enclosed package contains 50 copies of the Notice of Availability, the Preamble and Proposed Changes to the Code of Federal Regulations, the changes to the Fishery Management Plan, the Regulatory Impact Review/Initial Regulatory Flexibility Analysis (RIR/IRFA), the Environmental Assessment and the determination of consistency with the Alaska Coastal Zone Management Program. All of the above documents have been reviewed by the Regional Office and GCAK. The RIR/IRFA was reviewed by the Council, SSC, and AP at the July 1983 meeting and the Council reaffirmed its vote on Amendment 6 at that time.

This amendment package has taken eight months to prepare, which is appropriate considering the precedent setting nature of the proposal. I believe it is a worthwhile action and look forward to your favorable review.

Sincerely,

Jim H. Branson
Executive Director

Enclosures

cc: Robert W. McVey

37C/Y

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 611

Foreign Fishing, Groundfish of the Bering Sea and Aleutians Islands Area.

AGENCY: National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of availability of an amendment to a fishery management plan and request for comments.

SUMMARY: NOAA issues this notice that the North Pacific Fishery Management Council has submitted an amendment (Amendment 6) to the Fishery Management Plan for the Groundfish Fishery in the Bering Sea and Aleutian Islands Area for Secretarial review and is requesting comments from the public on both the amendment and the environmental assessment prepared on the amendment. Copies of the amendment and the environmental assessment may be obtained from the address below.

DATE: Comments on the plan amendment and/or the environmental assessment should be submitted on or before (enter date 75 days after filing with the FEDERAL REGISTER).

ADDRESS: All comments should be sent to Robert W. McVey, Director, Alaska Region, NMFS, P.O. Box 1668, Juneau, Alaska 99802.

Copies of the amendment and the environmental assessment are available upon request from the North Pacific Fishery Management Council, P.O. Box 103136, Anchorage, Alaska 99510.

FOR FURTHER INFORMATION, CONTACT: Jeffrey J. Povolny, North Pacific Fishery Management Council Groundfish Plan Coordinator, telephone: 907-274-4563.

SUPPLEMENTARY INFORMATION: The Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) requires that each regional fishery management council submit any fishery management plan or plan amendment it prepares to the Secretary of Commerce (Secretary) for review and approval or disapproval. This act also requires that the Secretary, upon reviewing the plan or amendment, must immediately publish a notice that the plan or amendment is available for public review and comment. The Secretary will consider the public comments in determining whether to approve the plan or plan amendment.

Amendment 6 proposes measures for managing the foreign groundfish fishery in the Bering Sea and Aleutian Islands area. Regulations proposed by the Council and based on this amendment are scheduled to be published within 30 days. (16 U.S.C. 1801 et seq.)

DATE: _____

_____
Acting Chief, Operations Coordination Group
National Marine Fisheries Service

33D/EE

Billing Code 3510-22

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 611

[Docket No.]

Foreign Fishing, Groundfish of the Bering Sea and Aleutian Islands Area.

AGENCY: National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed Rule.

SUMMARY: NOAA issues a proposed rule to implement Amendment 6 to the Fishery Management Plan for the Groundfish Fishery in the Bering Sea and Aleutian Islands Area. This amendment would establish a domestic fishery development zone in the Bering Sea and would prohibit all foreign harvesting of groundfish in that zone. This action is intended to provide a sanctuary for U.S. fishing vessels in a productive fishing area of the Bering Sea and to encourage the expansion of the U.S. groundfish fishery.

DATE: Comments on the amendment, proposed rule, and environmental assessment are invited until _____.

ADDRESS: Comments may be mailed to Robert W. McVey, Director, Alaska Region, National Marine Fisheries Service, P.O. Box 1668, Juneau, Alaska 99802, or delivered to Room 453, Federal Building, 709 West Ninth Street, Juneau, Alaska. Individual copies of the amendment, the environmental assessment and the

regulatory impact review/initial regulatory flexibility analysis may be obtained from the North Pacific Fishery Management Council, P.O. Box 103136, Anchorage, Alaska 99510, telephone 907-274-4563.

FOR FURTHER INFORMATION CONTACT: Jeffrey Povolny (Groundfish Plan Coordinator, North Pacific Fishery Management Council), 907-274-4563.

SUPPLEMENTARY INFORMATION:

Background

The Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (FMP) was implemented on January 1, 1982 (46 FR 63295, December 31, 1981), by the NOAA Assistant Administrator for Fisheries (Assistant Administrator) pursuant to the Magnuson Fishery Conservation and Management Act (Magnuson Act). Nine amendments to the FMP have been adopted by the North Pacific Fishery Management Council (Council) under the authority of the Magnuson Act. Five of these amendments have been implemented: Amendments 1a and 2 (47 FR 1295), Amendment 4 (48 FR 21336), Amendment 3 (48 FR 24719), and Amendment 7 (48 FR _____).

Amendment 6 to the FMP is the subject of this action and was adopted by the Council on September 23, 1982. The amendment proposes the establishment of a domestic fishery development zone (FDZ) in the Bering Sea where only U.S. fishing vessels would be permitted to harvest groundfish. Because the FDZ is known to be a productive fishing area, its establishment would encourage the development of the U.S. groundfish industry.

The FDZ (Figure 1) is located just north and west of Unimak Pass and is bounded by straight lines joining the following coordinates:

55°16'N. latitude, 166°10'W. longitude (westernmost corner of Bristol Bay Pot Sanctuary)

54°00'N. latitude, 166°10'W. longitude (Unalga Island), and

54°36'N. latitude, 164°55'42"W. longitude (Cape Sarichef Light)

The FDZ covers approximately 2,342 square miles and includes the continental shelf just north and west of Unimak Pass. This is only about 0.4% of the total Fishery Conservation Zone area (approximately 630,000 square miles) under the jurisdiction of the FMP.

The FDZ would be reserved for use by domestic fishing vessels--including those delivering to shore-based processors, U.S. catcher/processors, and foreign processing vessels involved in joint venture operations. All foreign harvest operations would be excluded year-round from the FDZ.

Development of a domestic groundfish fishery has been relatively slow in the Bering Sea and Aleutian Islands region. Yet this region has great potential for supporting a large domestic groundfish fishery. The present optimum yield (OY) of commercial groundfish species in the region is between 1.4-2.0 million metric tons (mt). Historically, most of the catch has been taken by foreign fisheries; only in the past two years has U.S. production exceeded 50,000 mt from the Bering Sea.

The FDZ proposed in Amendment 6 is a very productive fishing area in relatively close proximity to the only two developed harbors in the Bering Sea (Unalaska and Akutan) that have shore-based processing facilities. Over the past three years domestic fisheries for groundfish in the region (both shore-based and joint venture) have enjoyed some success. However, they are at a developmental stage and have difficulty competing effectively with foreign vessels on the same fishing ground at the same time because U.S. boats are generally much smaller than the foreign fishing vessels and can be easily preempted from the fishing grounds. Creation of the FDZ will effectively remove a six-month per year foreign fishery from the zone, since the area is part of the Winter Halibut Savings Area, which is currently closed to foreign trawling from December 1 to May 31.

Foreign catches in the FDZ from 1977 to 1980 averaged 73,046 mt, or approximately 6% of the average 1977-80 foreign catch of 1,300,063 mt. In 1981 domestic joint venture catches from the FDZ were about 12,167 mt. In addition, a portion of the 1981 domestically processed catch of 8,851 mt came from the FDZ. In 1982 domestic joint venture catches from the FDZ were about 18,963 mt, in addition to a portion of the domestically processed catch of 20,863 mt. It is not possible to determine how much of the domestically processed catch actually comes from the FDZ, but most of that catch is Pacific cod which have been relatively abundant in this area.

Developing U.S. groundfish fisheries are expected to benefit from the establishment of the FDZ in the following ways:

(1) operating efficiency of domestic vessels would increase because they could operate without interference or conflict with foreign vessels in the same physical space for groundfish species;

(2) the proposed FDZ is within the most productive fishing area in the Bering Sea and Aleutian Islands area and domestic catch rates for pollock and Pacific cod in the FDZ should increase when foreign effort is removed. Such increases, however, would diminish as U.S. fishermen are attracted to the FDZ by higher returns and domestic effort in the zone increases;

(3) costs of production to the U.S. groundfish industry would be reduced because of increased operating efficiency due to less crowding and improved groundfish catch rates; and

(4) the location of the FDZ is a logical choice due to its proximity to shoreside processing and support facilities, compared to equally productive areas further distant. This location complements the sanctuary for developing U.S. fisheries established south of Unimak Pass in the Gulf of Alaska, known as the Davidson Bank.

Classification

Section 304(a)(1)(C)(ii) of the Magnuson Act, as amended by P.L. 97-453, requires the Secretary of Commerce (Secretary) to publish regulations proposed by a Council within 30 days of receipt of an amendment and regulations. At

this time the Secretary has not determined that the amendment these rules would implement is consistent with the national standards, other provisions of the Magnuson Act, and other applicable law. The Secretary, in making that determination, will take into account the data, views, and comments received during the comment period.

The Council has prepared an environmental assessment (EA) for Amendment 6 and has preliminarily concluded that no significant impact on the human environment would result if the amendment were implemented. You may obtain a copy of the environmental assessment from the Council at the address listed above; public comments are invited.

The NOAA Administrator has determined that this proposed rule is not a "major rule" requiring a regulatory impact analysis under Executive Order 12291 (E.O. 12291), but that the proposed rule, if implemented, would have a significant beneficial effect on small entities within the meaning of the Regulatory Flexibility Act. These determinations were based upon the socio-economic effects of the proposed rule as analyzed in the regulatory impact review/initial regulatory flexibility analysis (RIR/IRFA) prepared by the Council. A summary of this analysis follows. A copy of the RIR/IRFA may be obtained from the Council at the address listed above.

If the proposed rule is implemented, the primary sources of benefits to domestic groundfish fishermen will be improvements in operating efficiency, or the amount of time a vessel spends fishing in a fixed season, and improved catch rates. If there is a crowding problem in the FDZ because of competition between domestic and foreign vessels, removal of foreign effort will reduce

it. While it was possible to estimate how a given improvement in operating efficiency (from reduced crowding) will benefit domestic fishermen, it was not possible to estimate how much domestic operating efficiency will improve with a reduction in foreign effort in the FDZ. Thus, it was not possible to provide a quantitative measure of this source of benefit.

The benefit to domestic fishermen of improved catch rates resulting from the removal of foreign effort from the FDZ is the reduced average cost of production for domestic fishing vessels, times tonnage landed. Under the methodology employed in the RIR/IRFA, these net benefits to U.S. pollock fishermen were conservatively estimated to range from $666,000 to $1,782,000. These benefits are viewed as short-term because an influx of domestic effort into the FDZ to supplant the expelled foreign effort will reduce marginal catch rates and the catch differential, until eventually an equilibrium of catch rates recurs and a redistribution of effort or new investment will serve to dissipate initial net benefits.

No information is available to infer what improved prospects (either in operating efficiency or catch rates) may result for Pacific cod fishermen from creation of the FDZ, since cod catches reported from that specific area are by-catches from foreign fleets targeting on pollock and from a limited U.S. joint venture operation targeting on Pacific cod in 1982. Benefits similar to those accruing to pollock operations may be expected to result to cod fishermen; if this proves to be the case, the net benefits presented above are low estimates.

Establishing the FDZ could affect the ability of shore-based processors to compete with at-sea processors. Most at-sea processing is provided now by foreign processing vessels in joint ventures with U.S. vessels fishing for pollock. U.S. shore-based processors are mainly receiving Pacific cod. If there were a shortage of catcher vessels, and active competition for their services, an increase in catch rates for pollock would make at-sea delivery relatively more attractive for harvesting vessels. Barring constraints on the daily quantities which a vessel can deliver, the catch rates increase would result in a larger increase in gross earnings to participants in joint ventures because more time can be spent fishing. Thus, the catch rate increase might force a shore-based processor to offer a higher price to his fishermen to compensate for the lower total catch which results, in part, from having to travel greater distances to deliver shoreside.

Currently, competition for the services of catcher vessels is not intense, nor is it expected to be in the near future because of the generally distressed state of Alaska's shellfish fisheries and the resulting attractiveness of the groundfish fisheries to U.S. crab and shrimp fishermen. Therefore, short-term increases in catch rates for pollock and cod resulting from the creation of the FDZ probably will not force shore-based processors to increase their price to attract deliveries of product. Nevertheless, the effects of a catch rate increase on the price offered by shore-based processors under conditions of excess demand for catcher vessels was examined as a worst case scenario. This analysis showed that even in this remote circumstance, and (even less likely) if as much as 50 percent of the FDZ catch were purchased by shore-based processors, a net benefit of $298,000 would result.

Creation of the FDZ should not affect retail prices for consumers. The predicted increase in domestic groundfish catch as a result of the establishment of the FDZ represents less than one percent of the portion of world groundfish supply which comes from the Bering Sea. (Bering Sea groundfish catch represents about three percent of the world groundfish catch each year.) Therefore, no change in retail price is expected.

This proposed rule is exempt from the procedures of E.O. 12291 under Section 8(a)(2) of that order. Deadlines imposed under the Magnuson Act, as amended by P.L. 97-453, require the Secretary to publish this proposed rule 30 days after its receipt. The proposed rule is being reported to the Director, Office of Management and Budget, with the explanation of why it is not possible to follow procedure of the order.

This rule does not contain a collection of information requirement for purposes of the Paperwork Reduction Act.

The Council determined that this rule will be implemented in a manner that is consistent to the maximum extent practicable with the approved coastal zone management program of the State of Alaska. This determination has been submitted to the State for review by the responsible State agencies under Section 307 of the Coastal Zone Management Act.

List of Subjects in 50 CFR Part 611

Fish, Fisheries, Foreign relations, Reporting requirements.

Dated: _____

_____
Carmen J. Blondin
Deputy Assistant Administrator for
Fisheries Resource Management
National Marine Fisheries Service

For the reasons set forth in the preamble, 50 CFR Part 611 is proposed to be amended as follows:

PART 611 - FOREIGN FISHING

1. The authority citation for Part 611 reads as follows:

AUTHORITY: 16 U.S.C. 1801 et seq., unless otherwise noted.

2. In Section 611.93 paragraph (c)(2)(ii)(C) is revised, (c)(2)(ii)(D) is redesignated as (c)(2)(ii)(E) and new paragraphs (c)(2)(ii)(D) and (c)(3)(iii) are added as follows:

Section 611.93 Bering Sea and Aleutian Islands groundfish fishery,

* * * * *

(c) * * *

(2) * * *

(ii) * * *

(C) From December 1 through May 31 in the Winter Halibut Savings Area which is the area bounded by straight lines connecting the following coordinates in the order listed:

54°00'N. latitude	166°10'W. longitude (Unalga Island)
52°48'N. latitude	170°00'W. longitude
55°30'N. latitude	170°00'W. longitude

55°30'N. latitude 166°47'W. longitude

56°00'N. latitude 167°45'W. longitude

56°00'N. latitude 166°00'W. longitude

56°30'N. latitude 166°00'W. longitude

56°30'N. latitude 163°00'W. longitude

56°20'N. latitude 163°00'W. longitude

55°16'N. latitude 166°10'W. longitude

54°00'N. latitude 166°10'W. longitude (Unalga Island)

(D) At all times in the Fishery Development Zone which is the area enclosed by straight lines connecting the following coordinates in the order listed:

54°36'N. latitude 164°55'42"W. longitude (Cape Sarichef light)

55°16'N. latitude 166°10'W. longitude

54°00'N. latitude 166°10'W. longitude (Unalga Island)

54°36'N. latitude 164°55'42"W. longitude (Cape Sarichef light)

(E) * * *

(3) * * *

(iii) Longlining by foreign vessels is prohibited at all times in the Fishery Development Zone which is the area designated under paragraph (c)(2)(ii)(D) of this section.

* * * * *

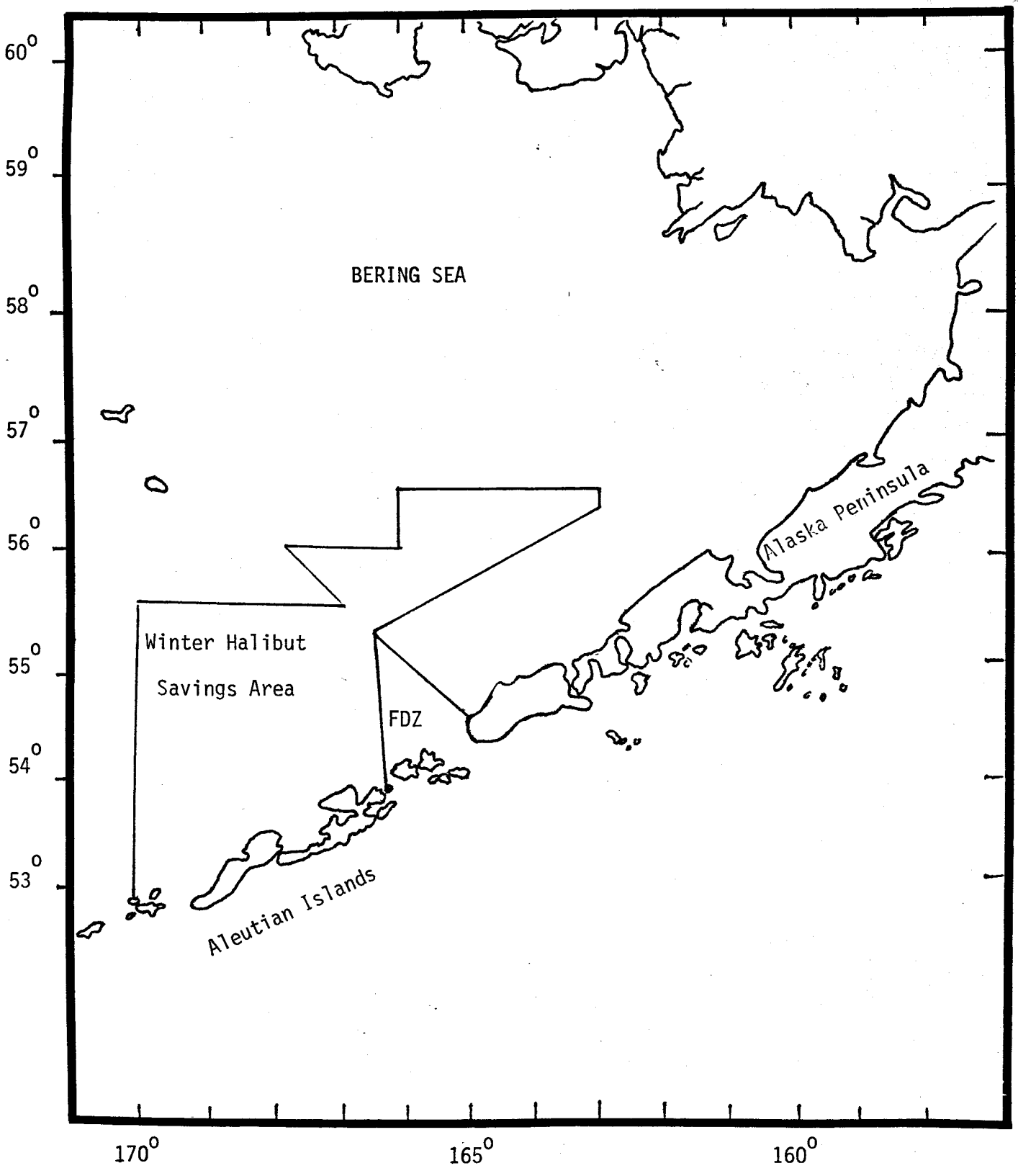

Figure 1.--Location of the Winter Halibut Savings Area and the U.S. Fishery Development Zone (FDZ) within the Bering Sea and Aleutian Islands area.

North Pacific Fishery Management Council
Bering Sea/Aleutian Islands Groundfish

Fishery Management Plan

Amendment 6

Changes to the FMP

1. Add to Section 14.5.3.1 (Amendment 1), Fishing Area Restrictions, the following:

(3) No foreign harvesting year-round in the Domestic Fishery Development Zone, as described in Appendix III (shown in Figure 27).

Rationale: To provide an area of high groundfish productivity as a sanctuary for developing U.S. fisheries, within range of already established cold storage and processing facilities at Dutch Harbor, Akutan, and Sand Point, and to provide an area with healthy groundfish concentrations for U.S. fishermen delivering their catch to at-sea processors.

2. Replace Figure 27, with Revised Figure 27, attached here.

3. Change the description of Area B, the Winter Halibut Savings Area, in Appendix III, as follows:

Area B -- Winter Halibut Savings Area

That portion of the Fishery Conservation Zone encompassed by straight lines connecting the following points, in the order listed:

Unalga Island (54°00'N, 166°10'W)
52°48'N - 170°00'W
55°30'N - 170°00'W
55°30'N - 166°47'W
56°00'N - 167°45'W
56°00'N - 166°00'W
56°30'N - 166°00'W
56°30'N - 163°00'W
56°20'N - 163°00'W
55°16'N - 166°10'W
Unalga Island (54°00'N, 166°10'W)

4. Add to Appendix III, the following:

Area G -- The Domestic Fishery Development Zone

That portion of the Fishery Conservation Zone encompased by straight lines connecting the following points, in the order listed:

Cape Sarichef Light (54°36'N - 164°55'42"W)
55°16'N - 166°10'W
Unalga Island (54°00'N - 166°10'W)
Cape Sarichef Light (54°36'N - 164°55'42"W)

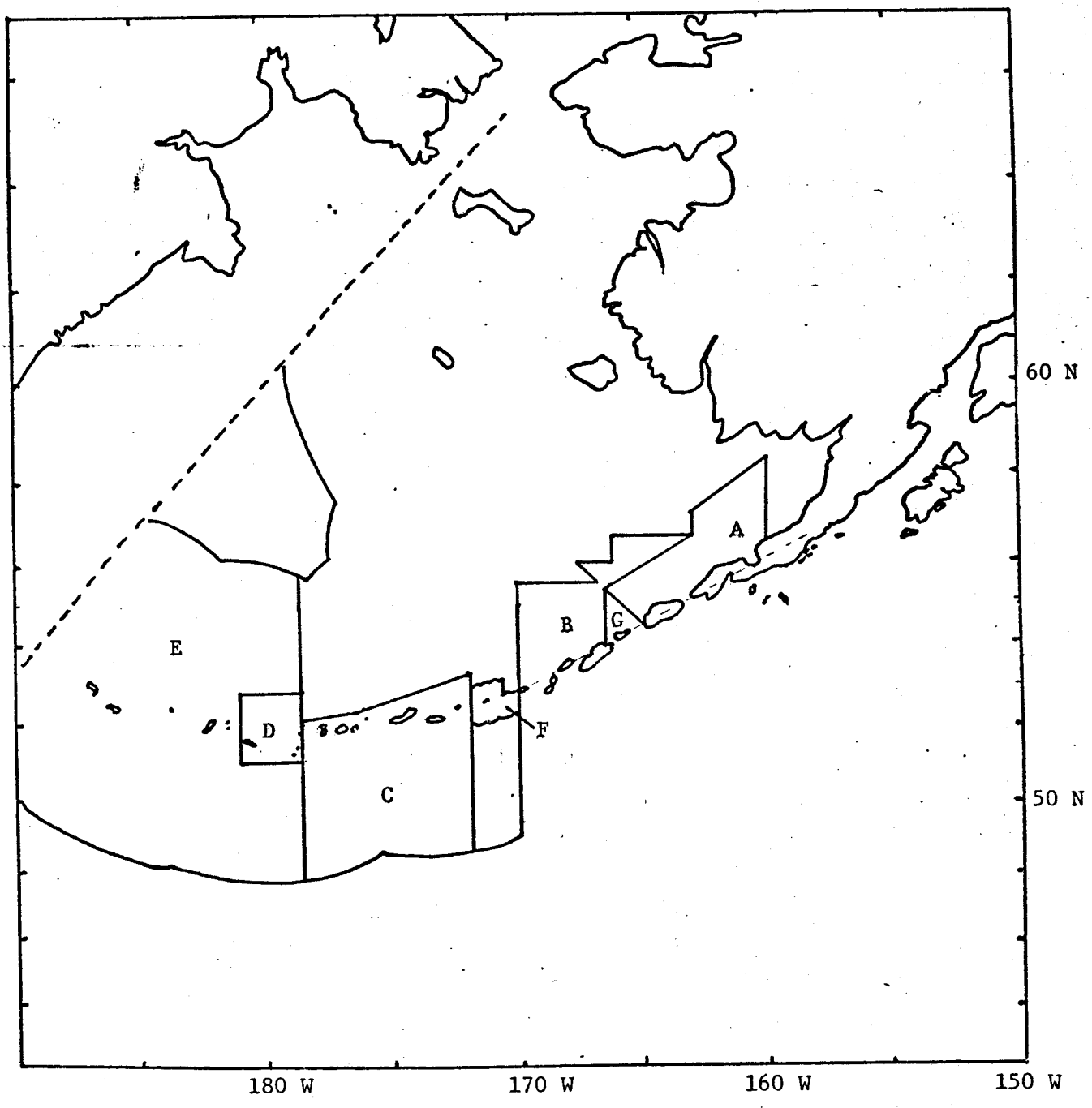

Figure 27 - Areas with special restrictions on foreign and/or domestic fisheries in the Bering Sea and Aleutian Islands Groundfish Plan area.

ENVIRONMENTAL ASSESSMENT ON AMENDMENT 6 TO THE FISHERY MANAGEMENT PLAN FOR THE GROUNDFISH FISHERY OF THE BERING SEA AND ALEUTIAN ISLANDS AREA

INTRODUCTION

The Fishery Managment Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (FMP) was adopted by the North Pacific Fishery Management Council (Council) in March 1979. The FMP was originally published in the FEDERAL REGISTER on November 19, 1979 (44 FR 66367), and was implemented by the Secretary of Commerce on January 1, 1982 (46 FR 63295, December 13, 1982), pursuant to Sections 302-305 of the Magnuson Fishery Conservation and Management Act (Magnuson Act). A final environmental impact statement was prepared for the FMP and is on file with the Environmental Protection Agency.

The Council now proposes an action under Amendment 6 to the FMP that would establish a sanctuary for domestic fishing vessels in a productive fishing area of the Bering Sea. This environmental assessment is prepared pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA) and its implementing regulations to determine whether an environmental impact statement must be prepared on the proposed action.

DESCRIPTION OF AND NEED FOR THE PROPOSED ACTION

The proposed action is to amend the FMP in order to establish a U.S. fishery development zone (FDZ) in the Bering Sea and designate the FDZ as a sanctuary

for domestic fishing vessels. The proposed amendment and the rationale for it follow:

Establish a domestic FDZ just north and west of Unimak Pass bounded by straight lines joining the following coordinates (Figure 1):

55°16'N. latitude, 166°10'W. longitude (westernmost corner of Bristol Bay Pot Sanctuary)

54°00'N. latitude, 166°10'W. longitude (Unalga Island)

54°36'N. latitude, 164°55'42"W. longitude (Cape Sarichef)

The FDZ is reserved for use by domestic fishing vessels--including those delivering to shore-based processors, U.S. catcher/processors, and foreign processing vessels involved in joint venture operations. All foreign harvest operations are excluded year-round from operating in the FDZ.

RATIONALE

Development of a domestic groundfish fishery has been relatively slow in the Bering Sea and Aleutian Islands region. Yet this region has great potential for supporting a large domestic groundfish fishery. The present optimum yield (OY) of commercial groundfish species in the region is between 1.4-2.0 million metric tons (mt). Historically, most of the catch has been taken by foreign fisheries; only in the past two years has U.S. production exceeded 50,000 mt from the Bering Sea.

The FDZ proposed in Amendment 6 is a very productive fishing area in relatively close proximity to the only two developed harbors in the Bering Sea (Unalaska and Akutan) that have shore-based processing facilities. Over the past three years domestic fisheries for groundfish in the region (both shore-based and joint venture) have enjoyed some success. However, they are at a developmental stage and have difficulty competing effectively with foreign vessels on the same fishing ground at the same time because U.S. boats are generally much smaller than the foreign fishing vessels and can be easily preempted from the fishing grounds.

The FDZ covers approximately 2,342 square miles and includes the continental shelf just north and west of Unimak Pass. This is only about 0.4% of the total Fishery Conservation Zone area (approximately 626,374 square miles) under the jurisdiction of the FMP. Creation of the FDZ will effectively remove a six-month per year foreign fishery from the zone, since the area is part of the Winter Halibut Savings Area, which is currently closed to foreign trawling from December 1 to May 31.

Foreign catches in the FDZ from 1977 to 1980 averaged 73,046 mt, or approximately 6% of the average 1977-80 foreign catch of 1,300,063 mt. In 1981 domestic joint venture catches from the FDZ were about 12,167 mt. In addition, a portion of the 1981 domestically processed catch of 8,851 mt came from the FDZ. In 1982 domestic joint venture catches from the FDZ were about 18,963 mt, in addition to a portion of the domestically processed catch of 20,863 mt. It is not possible to determine how much of the domestically processed catch actually comes from the FDZ, but most of that catch is Pacific cod which have been relatively abundant in this area.

Developing U.S. groundfish fisheries are expected to benefit from the establishment of the FDZ in the following ways:

(1) operating efficiency of domestic vessels would increase because they could operate without interference or conflict with foreign vessels in the same physical space for groundfish species;

(2) the proposed FDZ is within the most productive fishing area in the Bering Sea and Aleutian Islands area and domestic catch rates for pollock and Pacific cod in the FDZ should increase when foreign effort is removed. Such increases, however, would diminish as U.S. fishermen are attracted to the FDZ by higher returns and domestic effort in the zone increases; and

(3) costs of production to the U.S. groundfish industry would be reduced because of increased operating efficiency due to less crowding and improved groundfish catch rates; and

(4) the location of the FDZ is a logical choice due to its proximity to shoreside processing and support facilities, compared to equally productive areas further distant. This location complements the sanctuary for developing U.S. fisheries established south of Unimak Pass in the Gulf of Alaska, known as the Davidson Bank.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Alternative 1: Adopt Amendment #6. This is the proposed action and the preferred alternative. This alternative is preferred because it would respond to the situations and problems described in the statement of need that led to the formulation of the amendment.

Alternative 2: Status quo, do not adopt Amendment #6. Under this alternative, the situation and problems which led to the proposed action would not be addressed. United States fishing vessels would have to continue competing with foreign vessels for the same physical space. The foreign effort will continue resulting in generally lower catch rates for the U.S. vessels, and could retard development of the U.S. groundfish fishery. United States shore-based processing plants may have difficulties getting raw material and could suffer lower production. Therefore, this alternative is considered unacceptable.

Alternative 3: Modify the proposal to include a larger area. Under this alternative the FDZ would be defined so as to encompass a larger area, bounded by straight lines joining the following coordinates:

55°30'N. latitude, 165°10'W. longitude

55°30'N. latitude, 167°00'W. longitude

54°00'N. latitude, 167°00'W. longitude

54°30'N. latitude, 165°00'W. longitude

This alternative would respond to the situations and problems described in the statement of need that led to the formulation of the amendment.

This alternative would also make more groundfish available to U.S. fishermen in a larger area and in greater quantities relative to Alternative 1, without competition from foreign fleets. Foreign catches from 1978 through 1980 in this area averaged 40 percent greater for pollock and 36 percent greater for Pacific cod than in the proposed area under Alternative 1.

Written and verbal testimony presented to the Council indicated that the proposed area under Alternative 1 was adequate for the purposes of enhancing the development of domestic groundfish fisheries. Therefore, the Council considered Alternative 3 to be unnecessary. However, this latter alternative can be considered to be acceptable.

ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION AND ALTERNATIVES

Impacts on the Biological and Physical Environment

None of the alternatives just described are expected to have significant impacts on the biological or physical environment. Establishing an FDZ of either size described in Alternative 1 or 3 above merely allows the U.S. fishery to operate and develop with minimal adverse effects from the competing foreign fisheries. It does not affect the total allowable catches (TACs) of any of the groundfish species or species groups.

As the U.S. groundfish fishery continues to grow, more deliveries will be made to shore-based processing plants and additional amounts of fish wastes will have to be processed and then discharged into coastal waters. If there are short-term environmental effects near the coastline from this activiity, the responsibility for avoiding and remedying any problems associated with such discharge is vested by law in the United States Coast Guard, the Environmental Protection Agency, and the State of Alaska. More discussion of this aspect of groundfish fishing is found in the Final Environmental Impact Statement on the original FMP that is on file with the Environmental Protection Agency.

Under Alternative 1 and 3, foreign fishing would be excluded from fishing in the respective fishery development zones and foreign vessels would be forced to harvest their groundfish allocation from other areas of the Bering Sea and Aleutian Islands region that remain open to foreign fishing. As a result of foreign effort being concentrated in a smaller area, the pattern of foreign incidental catches of salmon, Pacific halibut, Tanner crab and king crab (prohibited species in the foreign groundfish fishery) could change. The extent of this change has been estimated by a time-area closure model of the Bering Sea, based on 1977-1980 catch information (Low et al., 1981). Under Alternative 1, no change in the incidental catch of Pacific halibut is estimated and only a small decrease in the king crab catch (minus one percent or 11,730 crab) is estimated. Increased incidental catches are predicated for Tanner crab (plus three percent or 569,279 crab) and salmon (plus ten percent or 10,052 fish). The impact on prohibited species resulting from the exclusion of foreign groundfish effort from a slightly larger area under Alternative 3 would be similar, with the Pacific halibut catch declining by an estimated two percent (75 mt), but the incidental catch of king crab, Tanner

crab and salmon increasing by two percent (27,300 crab), five percent (834,000 crab), and twenty percent (19,200 salmon), respectively. Although the model cited above predicted an increase in the incidental catch of salmon, king crab, and Tanner crab under Alternatives 1 and 3, this event will not occur for several reasons. First, an amendment to the FMP (Amendment 3) was recently implemented that established prohibited species catch limits for salmon, king crab, Tanner crab and Pacific halibut in the foreign trawl fisheries. Second, catches of prohibited species in the foreign trawl fisheries have shown a marked decline since 1980. Finally, because a nation's trawl fishery could be restricted through time-area closures if its share of a prohibited species catch limit established by Amendment 3 is reached, foreign nations have initiated gear experiments that are intended to help further reduce the incidental catch of prohibited species while still maintaining groundfish catches.

The impact on salmon, king crab, Tanner crab and Pacific halibut resulting from an increase in domestic effort in the fishery development zones proposed under Alternatives 1 and 3 has not been quantitatively estimated because information is insufficient to predict what the catch pattern by domestic vessels will be. U.S. joint ventures targeting on pollock primarily use mid-water trawl gear and the impact of these operations on bottom dwelling species such as halibut and crab are minimal. Because the use of mid-water trawl gear has also been shown to mitigate the incidental catch of salmon, an expanded U.S. pollock joint venture fishery in the FDZ is not expected to have an adverse impact on salmon, crab or halibut relative to foreign operations, and may, in fact, actually reduce the incidental take of these species from this area of the Bering Sea.

U.S. groundfish operations which target on Pacific cod primarily use demersal trawl gear. This gear type is known to catch greater amounts of prohibited species and in some instances, the incidental catch rate of prohibited species in U.S. bottom trawl operations (number of prohibited species per metric ton of groundfish caught) has been greater than that estimated for demersal trawl foreign operations. Although most of the current U.S. groundfish catch in the FDZ proposed under Alternatives 1 and 3 is pollock, an increase in domestic effort for Pacific cod in this area could be accompanied by an increase in the U.S. incidental catch of prohibited species, particularly Pacific halibut. U.S. observer information indicates that the incidental catch rate of Pacific halibut in U.S. joint venture fisheries targeting on Pacific cod in the FDZ averaged 7.8 fish/mt in 1980 and 13.0 fish/mt in 1982. Most of these fish were juvenile halibut, weighing approximately 1-2 kilograms per fish. The average incidental catch rate of halibut by Japanese small stern trawlers (a comparable vessel and gear-type to that used in the U.S. joint venture fisheries) fishing east of 170° West longitude ranged from 4.0 fish/mt in 1978 to 1.4 fish/mt in 1981.

Any projected increase in the domestic catch of halibut in the FDZ under Alternatives 1 or 3 would not be significant or biologically threatening. Furthermore, domestic groundfish fishermen are expected to adopt foreign gear technology directed at reducing the incidental catch of prohibited species. As a result, a reduction in the domestic incidental catch rate of these species is anticipated so that by the time domestic effort in the FDZ replaces current foreign effort, the associated impact on Pacific halibut and other prohibited species will likely be less than or similar to that of current foreign groundfish fisheries in the FDZ.

None of the alternatives considered are expected to have a significant effect on marine mammals even though marine mammals are closely associated with commercially exploitable concentrations of groundfish and direct physical conflicts with groundfish operations are inevitable. This problem is especially acute with respect to the northern sea lion. Preliminary U.S. observer information indicates that the incidental catch rate of northern sea lions in trawl operations is related to the local abundance and general proximity of these mammals to groundfish operations and not whether demersal or mid-water trawls are being used. Most of the sea lions taken are believed to be caught in surface waters during haul-back operations as they attempt to pursue fish inside the trawl net. As could be expected, the sooner trawl nets are brought on board, the greater the chance of survival of any marine mammals entrapped in the trawl gear. It has been speculated, therefore, that sea lions caught in U.S. joint venture operations may suffer a higher mortality relative to foreign operations because longer time is required by U.S. catcher vessels to retrieve and transfer cod ends to foreign processors. However, U.S. observer information on the take of marine mammals is not yet sufficient to quantitatively describe any such difference in incidental mortality rates of marine mammals between the foreign and domestic groundfish operations. In 1981, foreign vessel operators reported approximately 200 sea lions being taken in foreign groundfish operations off Alaska. U.S. observers reported an additional 14 sea lions taken in U.S. joint venture operations. Information is not available on the number of sea lions or other marine mammals taken in other domestic groundfish operations.

While the possibility exists that an expansion of U.S. joint ventures in the FDZ may slightly increase the incidental mortality of marine mammals in this

area, any such increase would be insignificant relative to the estimated size of the northern sea lion populations in Alaska, which currently ranges between 200,000 and 214,000 animals. This species is believed to be at or near the carrying capacity of its habitat and the population numbers are considered to be in excess of the lower level of the range of the optimum sustainable population (National Marine Fisheries Service, 1978).

None of the alternatives considered are expected to have a measurable impact on marine birds as domestic effort fully displaces foreign effort. Marine birds ought to be beneficially or adversely impacted to the same degree by domestic trawl operations as occurs presently in foreign trawl operations. Any such adverse impact that is intentionally or negligently caused by a fisherman would be in violation of the Migratory Bird Treaty Act.

If Amendment 6 is not adopted, the U.S. fishery would continue to develop, albeit more slowly. In the long run, all of the effects on the biological and physical environment would be as described above, therefore, there is essentially no difference between the three alternatives in this regard.

Impacts on the Socioeconomic Environment

The proposed action under Amendment 6 would have a favorable socioeconomic impact on the U.S. groundfish fishery. The regulatory impact review/initial regulatory flexibility analysis (RIR/IRFA) prepared on Amendment 6 fully discusses the socioeconomic impacts of the proposed action and its alternatives.

Effects on Endangered Species and on the Alaska Coastal Zone

For the reasons discussed above, none of the alternatives would constitute an action that "may affect" endangered or threatened species or their habitat within the meaning of the regulations implementing Section 7 of the Endangered Species Act of 1973. Thus, consultation procedures under Section 7 will not be necessary on the proposal and its alternatives.

Also for reasons discussed above, the preferred alternative will be carried out in a manner that is consistent to the maximum extent practicable with the Alaska coastal zone management program, in accordance with Section 307(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

FINDINGS OF NO SIGNIFICANT ENVIRONMENTAL IMPACT

For the reasons discussed above, it is hereby determined that neither approval and implementation of Amendment 6 nor any of the reasonable alternatives to that action would significantly affect the quality of the human environment, and that the preparation of an environmental impact statement on these actions is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

_____ _____

Assistant Administrator for Fisheries, NOAA Date

AGENCIES AND PERSONS CONSULTED

In the course of the preparation of this environmental assessment, the following persons and agencies were consulted:

Patrick J. Travers
Alaska Regional Counsel
NOAA

Loh-Lee Low
Deputy Division Director, REFM
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
NOAA

LITERATURE CITED

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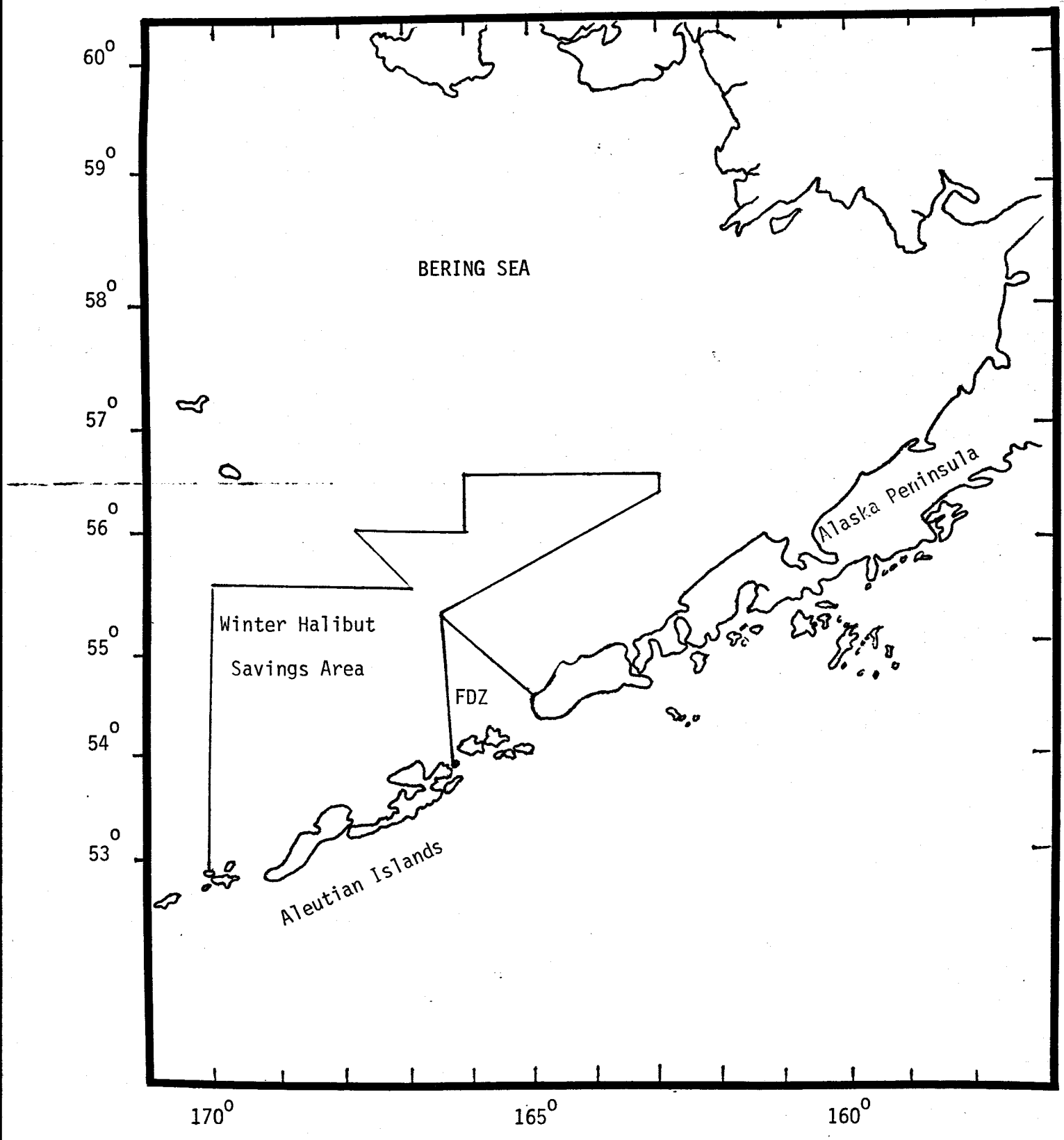

Figure 1.--Location of the Winter Halibut Savings Area and the U.S. Fishery Development Zone (FDZ) within the Bering Sea and Aleutian Islands area.

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

OFFICE OF THE GOVERNOR

DIVISION OF POLICY DEVELOPMENT AND PLANNING
GOVERNMENTAL COORDINATION UNIT

POUCH AW (MS - 0165)
JUNEAU, ALASKA 99811
PHONE: (907) 465-3562

March 31, 1983

Mr. Robert McVey
Director, Alaska Region
U.S. Department of Commerce
National Oceanic and
Atmospheric Administration
National Marine Fisheries Service
P.O. Box 1668
Juneau, AK 99802

In reply, refer to:
Division of Governmental
Coordination, Office of
Management and Budget

Subject: NO. PACIFIC FISHERY MANAGEMENT COUNCIL NOTICE OF RULE MAKING FOR BERING SEA FISHERY DEV. ZONE
BSIFP Amendment 1a.

Dear Mr. McVey:

The Division of Policy Development and Planning (DPDP) has reviewed the North Pacific Fishery Management Council's determination of consistency with the Alaska Coastal Management Program (ACMP) for the subject project. This proposed rule would establish an amendment to the fishery management plan which would prohibit all foreign harvesting in the groundfish fishery of the Bering Sea/Aleutian Islands.

The State was given authority under the Coastal Zone Management Act of 1972 to review direct federal activities for consistency with the Alaska Coastal Management Program. Fisheries management plans developed by the Council are considered to be direct federal actions which may affect the coastal zone and therefore are subject to consistency review.

In reviewing the proposed rulemaking, the Division concurs with your determination and finds that the proposed action is consistent with the provisions of the ACMP.

If you have any questions regarding this letter, please contact:

Wendy Wolf
State-Federal Coordinator
Pouch AW
Juneau, AK 99811
Phone # 465-3562

Sincerely,

Jay Hogan
Director

cc: William Delk, MOA
Merlin Wibbenmeyer, DNR
Mike Millar, DOT/PF
Bob Martin, ADEC
Linda Freed, Kodiak Island Borough
Beth A. Stewart, Commercial Fisheries Entry Commission
Jim Robison, Labor
Bill Paulick, CED

REGULATORY IMPACT REVIEW/INITIAL REGULATORY FLEXIBILITY ANALYSIS

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH FISHERY MANAGEMENT PLAN

ON

AMENDMENT #6

Establish a U.S. Fishery Development Zone

adopted by the
North Pacific Fishery Management Council

September 1982

North Pacific Fishery Management Council
P.O. Box 3136 DT
Anchorage, AK 99510

July 1983

EXECUTIVE SUMMARY OF THE
REGULATORY IMPACT REVIEW/INITIAL REGULATORY FLEXIBILITY ANALYSIS
TO THE BERING SEA/ALEUTIAN ISLANDS GROUNDFISH
FISHERY MANAGEMENT PLAN, AMENDMENT 6
which establishes a Fishery Development Zone

In compliance with Executive Order 12291, the Regulatory Flexibility Act (P.L. 96-354) and the Paperwork Reduction Act (P.L. 96-511), the North Pacific Fishery Management Council has prepared a Regulatory Impact Review/Initial Regulatory Flexibility Analysis (RIR/IRFA) on proposed Amendment #6 to the fishery management plan for groundfish in the Bering Sea and Aleutian Islands area (FMP).

Amendment #6 will establish a U.S. Fishery Development Zone (FDZ) just north and west of Unimak Pass. The FDZ will be reserved for use by domestic fishing vessels, including those delivering to shore-based processors, U.S. catcher/processors, and those delivering to foreign processing vessels (joint ventures).

The FDZ covers approximately 2,342 square miles and includes the continental shelf and slope just north and west of Unimak Pass. This is only about 0.4% of the total Fishery Conservation Zone area (approximately 626,374 square miles) under the jurisdiction of the FMP.

The Fishery Development Zone proposed in this amendment is a very productive area in close proximity to shore-based processing facilities in the only two developed harbors in the Bering Sea, Unalaska and Akutan. Within the last three years domestic fisheries (both shore-based and joint venture) for groundfish in the region have enjoyed some success. However, they are at an early stage in their development and have difficulty competing effectively with foreign vessels on the same fishing ground at the same time.

In order to assist U.S. vessels now operating in the proposed FDZ and to stimulate further development of domestic groundfish fisheries, the Council proposes that all foreign fishing be excluded year-round from the zone. This

action will effectively remove a six-month per year foreign fishery from the zone, since the area is part of the Winter Halibut Savings Area, which is currently closed to trawling from December 1 to May 31.

Foreign catches in the FDZ from 1977 to 1980 averaged 73,046 mt, or approximately 6% of the average 1977-80 foreign catch of 1,300,063 mt. In 1981 domestic joint venture catches from the FDZ were 12,167 mt. In addition, a portion of the 1981 domestically processed catch of 8,851 mt came from the FDZ. In 1982 domestic joint venture catches from the FDZ were 18,963 mt, in addition to a portion of the domestically processed catch of 20,863 mt. It is not possible to determine how much of the domestically processed catch actually comes from the FDZ, but most of that catch is Pacific cod which have been relatively abundant in this area.

Effects of creating the FDZ can be summarized as follows:

1. Impacts on the Harvesting Industry

The two primary sources of benefits to harvesters are expected to be improvements in operating efficiency, or the amount of time a vessel spends fishing in a fixed season, and improved catch rates.

(a) Improvements in operating efficiency from creation of the FDZ

In the past, American skippers have voiced concern about foreign fleets moving on the richest fishing grounds and effectively preempting them, forcing domestic vessels to handle their gear more and occasionally move away from the grounds. Increased competition from (and possible gear conflict with) foreign fleets may reduce fishing time and require more prospecting and moving of gear. Excluding foreign effort would therefore increase fishing time for the fleet, given a fixed season length.

Two steps are required to estimate monetary benefits to fishermen from increased fishing time resulting from the FDZ. First, it must be determined how a given increase in fishing time will benefit American fishermen; second, how much of an increase in fishing time for the American fleet will result.

It is possible to provide estimates of how a given increase in fishing time will benefit American fishermen (this is presented in Appendix 1), but there is no information available to evaluate how much of an increase in fishing time for the American fleet will result from the creation of the FDZ. Thus, it is not possible to provide a quantitative measure of this source of benefits.

(b) Improvements in catch rates

It is possible to estimate the benefits to American fishermen of improved catch rates resulting from the removal of foreign effort from the FDZ. Data presented to the Council at the time of their decision on the FDZ (at the September 1982 meeting) were fitted to simple catch-effort functions, which explain how total catch and catch rates range with increasing fishing effort applied to the stocks. The data used were monthly observations on catch and hours trawled for the Japanese fleet fishing in the FDZ from 1979-81 (Japanese catch was about 2/3 of the total FDZ catch). It was found that a logistic function fit the data better than a linear function, which demonstrated (as would be expected a priori) that catch per unit effort varies with the level of effort expended.

The empirically-demonstrable fact that catch rates vary with effort is used to estimate benefits accruing to American fishermen. These benefits are estimated for the pollock joint venture fishery only, since these American vessels will be among the first to benefit from the FDZ, and most (87%) of the foreign FDZ catch is pollock. Lack of information hampered attempts to quantify benefits to cod fishermen.

The preferred catch-effort model predicts that catch per unit effort will increase as foreign effort in the FDZ is reduced. Removal of foreign effort will create a catch-rate differential between the FDZ and nearby areas, and a financial incentive for American effort to move into the zone. The higher catch rates reduce the average cost of production for American vessels, increasing profits. However, a continuing influx of American effort to supplant the expelled foreign effort will serve to reduce catch rates and the catch differential, slowing the movement of effort into the FDZ until eventually an equilibrium of catch rates recurs.

The benefit to American fishermen is the reduced average cost of production resulting from the FDZ, times tonnage landed. How much the average cost of production is reduced depends on what it would have been absent creation of the FDZ, and how much tonnage is landed by American vessels in the FDZ. The average cost of production without the FDZ depends in part on what catch rates are for American fishermen before the FDZ is created. While they cannot be estimated exactly, these catch rates can be fixed within reasonable bounds. Given some estimates of this "opportunity catch," tonnage landed in the FDZ can be predicted from the catch-effort model. Employing different estimates of opportunity catch and the catch-effort models for 1979-81, net benefits to harvesters from creation of the FDZ were estimated to range from $666,000 to $1,782,000. These are estimates of the total benefits resulting from lower cost of production from the initial creation of the FDZ up to the point where catch rates readjust to an equilibrium. It is not easy to specify the time frame during which this will occur, but indications are that it will be short-term in duration, i.e., 1-2 fishing seasons. They are believed to be conservative because at every step in the analysis efforts were made to err on the low side. However, uncertainties about the quality of data used and the effect of influences which could not be modelled require that the numerical estimates be considered approximate, and indicative of the kinds of cost savings that could result to American harvesters from increased catch rates.

Two adjustment effects are expected when the FDZ is created. First, there will be a redistribution of current groundfish effort into the zone, and it may include some vessels new to the groundfish fishery, for which the added returns from higher catch rates exceeds what they could earn in other fisheries. Second, over the longer term, any increase in expected average catch resulting from a scarcity of available vessels (though highly unlikely) would make investment in new vessels more attractive.

The benefit which was presented is, necessarily, a short-term benefit; that is, it captures only the first adjustment just mentioned. It would not be expected to persist into perpetuity; rather, the redistribution of effort it stimulates or new investment which it attracts should serve to dissipate it. How long the adjustment process takes cannot be determined; what can be said, though, is that if the response mechanism is slow, the vessels which do fish

FDZ waters will continue to achieve higher profits. Because the benefits calculated in this analysis pertain only to the first adjustment to creation of the FDZ, they may be conservative.

Additionally, it should be reemphasized that only one of several potential sources of benefits to fishermen has been analyzed here. No attempt could be made to identify improvements in operating efficiency of American vessels which might result from reductions in crowding in FDZ waters. This would also be a short-term benefit, since American effort migrating to FDZ waters would at least partially offset the reduced foreign effort. Also, very little information is available to infer what improved prospects (either in operating efficiency or catch rates) may result for cod fishermen from creation of the FDZ, since the only reported cod catches from that area are by-catches from foreign fleets targeting on pollock, and from limited U.S. joint venture operations targeting on Pacific cod in 1980 and 1982. Benefits similar to those accruing to pollock operations may result to cod fishermen; if this proves to be the case, it is another reason why the figures presented here are low estimates. The complete analysis summarized here is found in Section III.B.1.

2. Impacts on the Processing Sector

Establishing the FDZ could affect the ability of shore-based processors to compete with at-sea processors. Most at-sea processing is provided now by foreign processing vessels in joint ventures with U.S. vessels fishing for pollock. U.S. shore-based processors are mainly receiving Pacific cod. If there were a shortage of catcher vessels, and active competition for their services, an increase in catch rates for pollock would make at-sea delivery relatively more attractive for harvesting vessels. Barring constraints on the daily quantities which a vessel can deliver, the catch rate increase would result in a larger increase in gross earnings to participants in joint ventures because more time can be spent fishing. Thus, the catch rate increase might force a shore-based processor to offer a higher price to his fishermen to compensate for the lower total catch which results, in part, from having to travel greater distances to deliver shore-side.

Currently, competition for the services of catcher vessels is not intense, nor is it expected to be in the near future because of the generally distressed state of Alaska's shellfish fisheries and the resulting attractiveness of the groundfish fisheries to U.S. crab and shrimp fishermen. Therefore, short-term increases in catch rates for pollock and cod resulting from the creation of the FDZ probably will not force shore-based processors to increase their price to attract deliveries of product. Nevertheless, the effect of catch rate increase on the price offered by shore-based processors under conditions of excess demand for catcher vessels was examined as a worst case scenario. This analysis (found in Appendix 3) showed that even in this remote circumstance, and (even less likely) if as much as 50% of the FDZ catch were purchased by shore-based processors, net benefits would be approximately one-half their expected level; that is, gains to harvesters would be approximately double the higher costs to shore-based processors.

3. Impacts on Consumers

Creation of the FDZ should not affect retail prices for consumers. The predicted increase in domestic groundfish catch as a result of the establishment of the FDZ represents less than 1% of the portion of world groundfish supply which comes from the Bering Sea. (Bering Sea groundfish catch represents about 3% of the world groundfish catch each year.) Therefore, no change in retail price is expected.

Even though foreign producers could incur some added costs of production as a result of being displaced from the FDZ, the competitiveness of world groundfish markets and the fact that only a portion of the foreign-produced pollock enters American markets will prevent any increased costs of production from being passed on to American consumers.

4. Effects on Foreign Fleets

The proposed FDZ should not adversely affect the ability of foreign fisheries to catch their allocations of groundfish. However, since foreign fleets will have to alter existing fishing patterns, which are presumably optimal, it is likely that the foreign allocations of groundfish will be achieved at some

additional cost, lowering profits to foreign fishing companies. Because world markets for groundfish are so competitive, their ability to pass on these higher costs of production will likely be quite limited.

The Bering Sea time-area closure model suggests that displacement of foreign effort from the FDZ will not cause early closure of the foreign fisheries for groundfish due to premature achievement of the quota for any single species. However, it is possible (though unlikely) that the economics of harvesting will be a binding constraint for foreign fleets and that the additional costs due to the FDZ will result in a slightly lower foreign harvest. It is also true that increases in domestic harvests will result in lower foreign harvests; therefore, should the FDZ encourage increased domestic groundfish fishing it will not be possible to attribute lower foreign harvests solely to additional costs of operation.

5. Effects on Taxpayers and the U.S. Treasury

The analysis suggests that taxpayers will be generally unaffected by the creation of the proposed FDZ, except in the unlikely circumstance that the additional costs imposed upon foreign fleets result in slightly reduced harvests. In this event, there could be some reduction in foreign fee receipts; however, these fees are designed to recover costs of management and enforcement of foreign fishing, and reductions in foreign fee receipts should, after the system adjusts, be accompanied by reductions in costs of management and enforcement, or by an increase in fee rates, so the net cost would be zero.

The proposed FDZ could enhance the climate for success of several bottomfish ventures which have federal financing or loan guarantees. Total federal money spent, committed, or potentially obligated, through guaranteed loans to develop the domestic bottomfish industry off Alaska amounts to nearly $105,200,000. This does not include funds committed by the State of Alaska or private sources.

Although establishing the FDZ will not assure success of these investments, this RIR/IRFA clearly demonstrates that excluding foreign fishing effort from a small but highly productive part of the Bering Sea will result in significant benefits to domestic fishermen. Thus, the FDZ would create conditions which favor the success of the government's financial commitments.

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I. INTRODUCTION

The current administration's policy on the development and issuance of regulations is established by Executive Order 12291. The main objectives of that policy are to reduce the burdens imposed by existing and future regulations, to increase agency accountability for regulatory actions, to provide for Presidential oversight of the regulatory process, minimize duplication and conflict of regulations, and insure well reasoned regulations. Under these guidelines each agency, to the extent permitted by law, is expected to comply with the following requirements:

1. Administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action;

2. Regulatory action shall not be undertaken unless the potential benefits to society from the regulation outweigh the potential costs to society;

3. Regulatory objectives shall be chosen to maximize the net benefits to society;

4. Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society shall be chosen; and

5. Agencies shall set regulatory priorities with the aim of maximizing the aggregate net benefit to society, taking into account the condition of the particular industries affected by regulations, the condition of the national economy and other regulatory actions contemplated for the future.

In compliance with Executive Order 12291, the National Marine Fisheries Service (NMFS) requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions which either implement a new fishery management plan (FMP) or significantly amend an existing FMP, or which may be significant

in that they affect important Department of Commerce/National Oceanic and Atmospheric Administration (DOC/NOAA) policy concerns and are the objective of public interest. The RIR also serves in some instances as the Initial Regulatory Flexibility Analysis (IRFA). The RIR/IRFA: (1) provides a comprehensive review of the level and incidence of impact associated with the proposed or final regulatory actions; (2) provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems; and (3) ensures that the regulatory agency or council systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether the proposed regulations implementing the FMP or amendment are major under criteria provided in Executive Order 12291 (described above), whether or not the proposed regulations will have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act (P.L. 96-354), and whether or not the Paperwork Reduction Act of 1980 (P.L. 96-511) applies. The primary purpose of the Regulatory Flexibility Act is to relieve small businesses, small organizations, and small governmental jurisdictions (collectively, "small entities") from burdensome regulatory and recordkeeping requirements. This Act requires that if regulatory and recordkeeping requirements are not burdensome, then the head of an agency must certify that the requirement, if promulgated, will not have a significant economic effect on a substantial number of small entities.

The purpose of the Paperwork Reduction Act, in part, is to minimize the federal paperwork burden for individuals, small businesses, state and local governments and other persons. This Act requires each agency to ensure that its information systems do not overlap each other or duplicate the systems of other agencies.

II. BACKGROUND

A. General

In 1977, under authority of the Magnuson Fishery Conservation and Management Act (Magnuson Act), the Secretary of Commerce assumed management jurisdiction over foreign fishing for Bering Sea and Aleutian Islands area groundfish in the 3-200 mile Fishery Conservation Zone (FCZ) by promulgating the Trawl and Herring Gillnet Fisheries of the Eastern Bering Sea and Northeast Pacific Preliminary Management Plan (PMP). The PMP was published in the Federal Register (43 FR 9298) on February 15, 1977, and implemented March 1, 1977. It regulated foreign fishing through 1981. The North Pacific Fishery Management Council (Council) developed a Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Island Area (FMP) and submitted it in 1979 to the Assistant Administrator for approval and implementation under the Magnuson Act. The FMP and its implementing regulations became effective on January 1, 1982 (46 FR 63295) and govern fishing for groundfish by United States and foreign vessels in the FCZ of the Bering Sea and part of the North Pacific Ocean adjacent to Alaska west of 170° west longitude.

The Council has developed eight amendments to the FMP. Amendments #1a and #2 primarily addressed limitations on the prohibited species catch of chinook salmon in the foreign trawl fishery and adjustments in various species quotas. Amendment #3 reduced the prohibited species catches of all salmon, Pacific halibut, king crab and Tanner crab in the foreign trawl fisheries, and Amendment #4 adjusted various species quotas and allocations and foreign fishery area restrictions. Amendment #5 would have further reduced the prohibited species catch of chinook salmon in the foreign trawl fisheries but was withdrawn from Secretarial review due to implementation of Amendment #3, Amendment #6 (the subject of this RIR) establishes a U.S. Fishery Development Zone, and Amendment #7 will modify the restrictions on foreign longline fisheries in the Winter Halibut Savings Area.

B. Purpose, Description, and Physical Location

The purpose of Amendment #6 is to establish a U.S. Fishery Development Zone (FDZ) just north and west of Unimak Pass as shown in Figure 1. The FDZ will be reserved for use by domestic fishing vessels, including those delivering to shore-based processors, U.S. catcher/processors, and those delivering to foreign processing vessels (joint ventures).

The FDZ is bounded by straight lines joining the following coordinates:

55°16'N, 166°10'W (western most corner of Bristol Bay Pot Sanctuary)
54°00'N, 166°10'W (Unalga Island), and
54°36'N, 164°55'42"W (Cape Sarichef Light, Southern most corner of Bristol Bay Pot Sanctuary)

It covers approximately 2,342 square miles and includes the continental shelf and slope just north and west of Unimak Pass. This is only about 0.4% of the total Fishery Conservation Zone area (approximately 626,374 square miles) under the jurisdiction of the FMP.

Development of domestic groundfish fisheries has been slow in the Bering Sea/Aleutian Islands region. Yet this region has the greatest potential of any area in the United States for supporting a large domestic groundfish fishery. The present Optimum Yield (OY) of groundfish in the region is 1.4-2.0 million metric tons. Historically, almost all of the catch has been taken by foreign fisheries, and only in the past two years has U.S. production exceeded 50,000 mt from the Bering Sea.

The Fishery Development Zone proposed in this amendment is a very productive area in close proximity to shore-based processing facilities in the only two developed harbors in the Bering Sea, Unalaska and Akutan. Within the last three years domestic fisheries (both shore-based and joint venture) for groundfish in the region have enjoyed some success. However, they are at an early stage in their development and have difficulty competing effectively with foreign vessels on the same fishing ground at the same time.

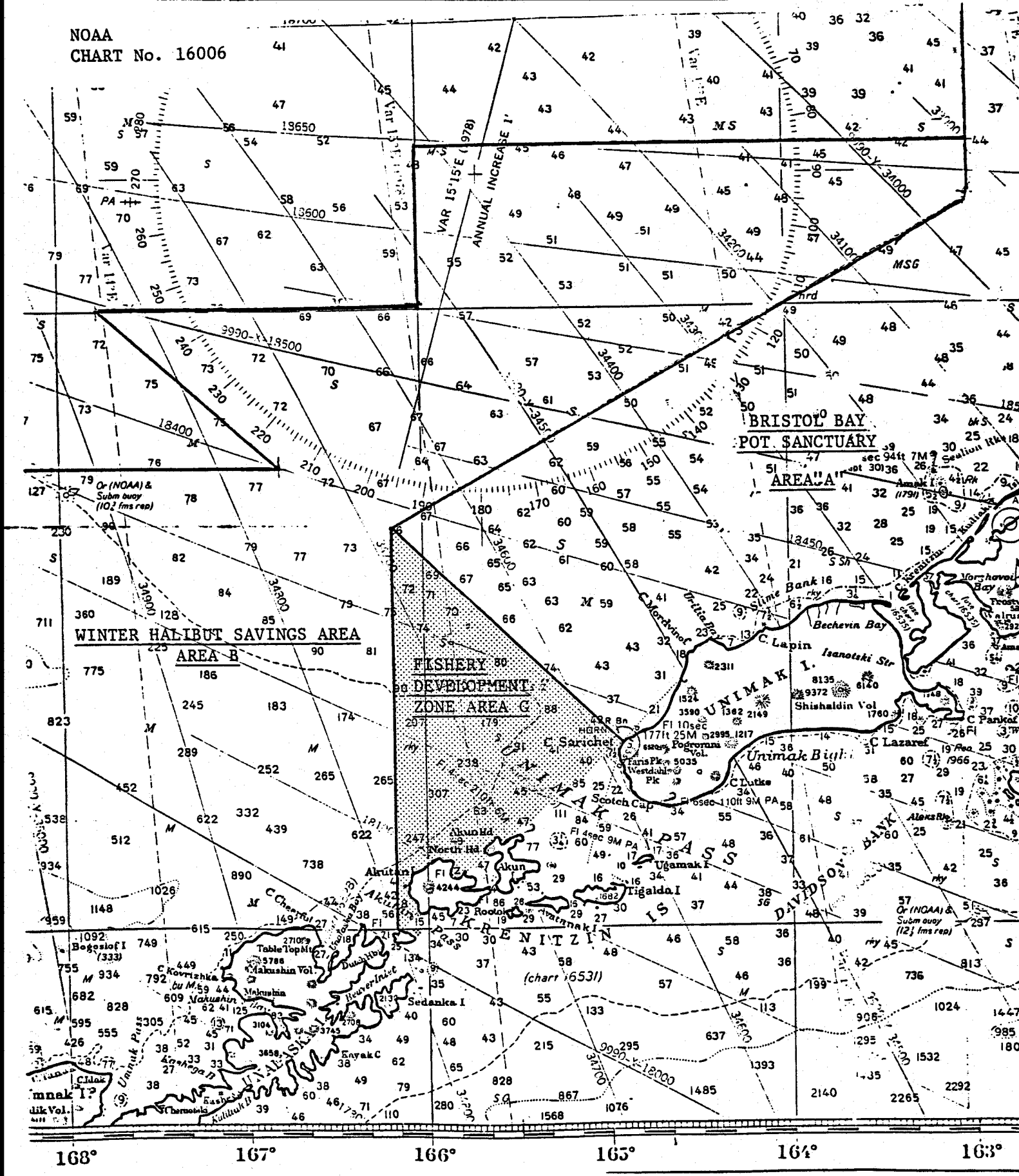

FIGURE 1. Location of the U.S. Fishery Development Zone

In order to assist U.S. vessels now operating in the proposed FDZ and to stimulate further development of domestic groundfish fisheries, the Council proposes that all foreign fishing be excluded year-round from the zone. This action will effectively remove a six-month per year foreign fishery from the zone, since the area is part of the Winter Halibut Savings Area, which is currently closed to trawling from December 1 to May 31.

C. Current Fishing Activity

1. Wholly Domestic Operations

Three types of domestic operations would occur in the proposed FDZ: catcher/processors, deliveries to shore-based fish plants, and deliveries to floating processors.

(a) U.S. Catcher/Processors

There are currently only three U.S. catcher/processors which operate in the FDZ. The most active of these is the ARCTIC TRAWLER owned and operated by Trans Pacific International Industries, Inc. The company produced 900 mt of Pacific cod fillets in 1980, 1,700 mt in 1981, and 2,160 mt in 1982. This represents approximately 4,500 mt, 8,500 mt and 10,800 mt round weight in 1980, 1981 and 1982, respectively.

The ARCTIC TRAWLER fishes all the Pacific cod grounds in the Bering Sea and along the Aleutian Islands, including the FDZ. Catch reports from the ARCTIC TRAWLER are not specific enough to determine the amount of Pacific cod caught in the FDZ, although the vessel does fish in the area.

Two smaller catcher/processors are reported to be fishing for Pacific cod. The vessel NORTHWEST ENTERPRISES fished in the eastern Bering Sea in 1982 but production is not known. The vessel reportedly produced shatterpack cod fillets and expects to catch 8 million pounds of cod in 1983. The vessel AMERICAN NO. 1 is fishing for Pacific cod and expects to catch 8 million pounds in 1983. The fish is reported to be headed, gutted, frozen on board and transhipped to Seattle for further processing.

A new 201-foot trawler/processor is being built by J.M. Martinac of Tacoma, Washington, for the Glacier Fish Company. The vessel, yet to be named, is to be used to catch and process Pacific cod and pollock off Alaska. It can be expected to fish in the FDZ. The vessel's production capacity is estimated to be at least equal to that of the ARCTIC TRAWLER.

(b) U.S. Deliveries to Shore-based Fish Plants

Shore-based companies known to have processed Alaskan bottomfish in 1982 are Trident Seafoods, Johansen Sea-Pro, Jangaard Alaskan Fisheries and Universal Seafoods. These companies are all located in Dutch Harbor and Akutan, very close to or actually bordering the FDZ. As of this writing only Trident Seafoods and Johansen Sea-Pro are still taking deliveries.

The Alaska Department of Fish and Game reports that as of December 31, 1982, thirty-seven U.S. vessels made over 347 landings of bottomfish to shore-based fish processing plants on Akutan and at Dutch Harbor, with the greatest share being landed at the Trident Seafood plant on Akutan.

The bulk of the catch in 1982 has been Pacific cod, with small amounts of pollock and flounders. Reported catches in 1982 are 14,594 mt of Pacific cod, 129 mt of pollock, plus traces (less than 10 mt) of flounders, Pacific ocean perch and rockfish.

Because of the way the catch statistics are reported, catch from the FDZ cannot be identified. However, reports from fishermen indicate that most of the Pacific cod landed in Akutan this year came from the FDZ.

(c) U.S. Deliveries to U.S. Floating Processors

In 1982 three U.S. firms were taking deliveries at sea of U.S.-caught bottomfish. They were Alaska Brands Corporation, Sea Alaska Products and Clipperton, Inc.

Clipperton, Inc. operated the floating processor SPEEDWELL. Its annual production is projected to be about 9,000 mt round weight of Pacific cod. In May of 1982 Clipperton reported that they had two U.S. catcher vessels delivering bottomfish.

Sea Alaska Products operates the SEA ALASKA, a former naval vessel converted to a fish processor. This vessel is 330 feet long and 4,000 gross tons. Its annual production capacity is projected to be 16,000 to 20,000 mt of Pacific cod round weight per year. Plans call for up to six U.S. catcher boats to make deliveries.

The GOLDEN ALASKA is a foreign built ship which has been purchased by Alaska Brands Corporation, a New York based company wholly owned by Inlaks Seafood Corporation. The GOLDEN ALASKA cannot fish or engage in coastwide trade under U.S. law. It can receive and process domestically-caught fish, and the company is reported to be planning shipment of product from the Bering Sea to U.S. markets via Dutch Harbor and Kodiak.

The GOLDEN ALASKA is 302 feet long and 3,240 gross tons. Its annual production capacity has been estimated at about 30,000 mt round weight of Pacific cod. Plans call for four U.S. catcher vessels to make deliveries to it. It only worked for about one month in 1982 and is expected to begin full scale operations in January 1983.

Actual production of all three floating processors in 1982 is difficult to determine, although their production is included in the 1982 Bering Sea catch of Pacific cod of 27,031 mt reported by ADF&G. If all three processors operate at estimated full capacity in 1983, they will require 59,000 mt of Pacific cod. As of this writing, only the GOLDEN ALASKA is expected to operate in 1983.

It is not possible to determine how much 1982 production came from the FDZ, nor how much will come from there in 1983. However, the three floating processors have the ability to move close to good fishing grounds, wherever they may be. Due to the substantial resource available in the FDZ, a significant part of the 1983 catch will probably come from there.

2. U.S. Deliveries to Foreign Processing Vessels (Joint Ventures)

In 1982 there were eight joint ventures in the Bering Sea/Aleutian Islands area. The joint ventures consist of a foreign fishing company buying U.S.-caught fish for processing on foreign ships in the FCZ, and subsequent transfer to foreign ports. The 1982 total joint venture catch of 108,566 mt was taken by thirty-two U.S. catcher vessels working with eighteen foreign processor ships. Some of the U.S. vessels fished for more than one joint venture (Table 1). In 1982 domestic joint venture catches from the FDZ were estimated to be 18,963 mt, while for 1981 they were estimated at 12,167 mt.

The National Marine Fisheries Service estimates that joint ventures will need 227,715 mt of groundfish from the Bering Sea/Aleutian Islands region in 1983 (Table 2). Since most of the 1983 joint venture needs are pollock (129,000 mt) and Pacific cod (26,000 mt), and since the FDZ is an excellent fishing area for these species, 1983 joint ventures will probably fish this area heavily.

3. Foreign Fisheries

In 1982, directed foreign fisheries in the Bering Sea/Aleutian Islands took 1,185,607 mt of groundfish. This catch is slightly less than the four-year average foreign catch of 1,300,063 mt.

Analysis of foreign catch statistics by NMFS shows that 73,046 mt, or approximately 6% of the average 1977-1980 catch, came from the FDZ. The breakdown by major species was pollock 87% (63,713 mt), Pacific cod 4% (2,942 mt), flatfishes 4% (2,889 mt), Pacific ocean perch 0.4% (290 mt) and sablefish 0.2% (156 mt).

The average foreign catch indicates a potential exists for directed pollock fisheries in the FDZ. However, Pacific cod is allocated as an incidental species in the foreign trawl fisheries, and therefore, foreign catch does not fully demonstrate the potential harvest available for U.S. fishermen.

TABLE 1. 1982 Joint Venture Catches (Bering Sea/Aleutian Islands)

Species	Catch (mt)
Pollock	54,605
Pacific cod	13,591
Yellowfin sole	17,414
Other flounders	9,130
Turbots	87
Pacific Ocean perch	28
Other rockfish	1
Sablefish	124
Atka mackerel	12,475
Squid	5
Other species	1,106
TOTAL	108,566

Source: NMFS

TABLE 2. 1983 Estimated Joint Venture Needs (Bering Sea/Aleutian Islands)

Species	Estimated Catch (mt)
Pollock	129,000
Pacific cod	26,000
yellowfin sole	30,000
Other flounders	14,000
Turbots	75
Pacific Ocean perch	1,740
Other rockfish	450
Sablefish	400
Atka mackerel	20,000
Squid	50
Other species	6,000
TOTAL	227,715

Source: NMFS

III. BENEFITS AND COSTS OF AMENDMENT #6

A. Impacts on Foreign Groundfish Fisheries

Foreign fisheries will probably be able to maintain their traditional harvest levels after the FDZ has been implemented. To evaluate the possible effects of the FDZ on foreign fisheries, a Bering Sea time-area closure model (Low et al. 1981) was queried to determine the potential resource available from this area and how the catch by the foreign fishery might be redistributed if displaced from the area.

When an area is closed, the model assumes that the foreign nations will reallocate their fishing effort outside the area during the closure period. The model simulates how the effort will be increased and predicts the resulting catches: tonnage by species, area and time period.

Table 3 presents the model predictions of foreign catches inside and outside the FDZ for a year-round closure, and shows that foreign fisheries would likely achieve their quotas. No nation would be in danger of a premature closure of its entire groundfish fishery due to early achievement of a species quota, assuming that a nation will adjust its fishing patterns.

Since foreign fleets will have to alter existing fishing patterns, which are presumably optimal, it is likely that the foreign allocations of groundfish will be achieved at some additional cost, lowering profits to foreign fishing companies. Because world markets for groundfish are so competitive, their ability to pass on these higher costs of production will likely be quite limited.

Even though the Bering Sea time-area closure model suggests that displacement of foreign effort from the FDZ will not cause early closure of the foreign fisheries for groundfish due to premature achievement of the quota for any single species, it is possible (though unlikely) that the economics of harvesting will be a binding constraint for foreign fleets and that the additional costs due to the FDZ will result in a slightly lower foreign harvest. It is also true that increases in domestic harvests will result in

TABLE 3. Predicted Effect of FDZ Closure on the Foreign Catch of Groundfish in the Bering Sea/Aleutian Islands Region (Based on 1977-80 averages)

(1) No closure (Status Quo)

Species	Catch in FDZ (mt)	Catch Outside FDZ (mt)	Total Catch
Pollock	63,713	876,197	939,910
Pacific cod	2,942	35,601	38,543
Yellowfin sole	648	86,606	87,254
Turbots	423	9,968	10,391
Other flounders	1,818	78,418	80,236
Sablefish	156	2,535	2,691
Atka mackerel	1,161	22,415	23,576
Pacific Ocean perch	290	6,704	6,994
Rockfish	31	10,414	10,445
Other species	1,858	56,779	58,637
All groundfish	73,040	1,185,637	1,258,677

(2) Year-round closure (Effect of Implementing Amendment #6)

Pollock	-0-	939,788	939,788
Pacific cod	-0-	37,400	37,400
Yellowfin sole	-0-	88,727	88,727
Turbots	-0-	10,337	10,337
Other flounders	-0-	80,404	80,404
Sablefish	-0-	2,687	2,687
Atka mackerel	-0-	22,982	22,982
Pacific Ocean perch	-0-	6,951	6,951
Rockfish	-0-	10,587	10,587
Other species	-0-	58,562	58,562
All groundfish	-0-	1,258,425	1,258,425

lower foreign harvests; therefore, should the FDZ encourage increased domestic groundfish fishing it will not be possible to attribute lower foreign harvests solely to any imposition of additional costs of foreign operation.

If establishment of the FDZ results in increased catches of groundfish for U.S. harvesters and a corresponding decrease in groundfish available for foreign fishermen there will be an attendant decrease in foreign fishing fees. The loss in these fees, which are nominal (pollock fees are $31/mt), would probably be more than offset by the value which would accrue to the U.S. through increased revenues to fishermen, and value added in processing, packaging and marketing. Additionally, any reduction in foreign fees cannot be considered a net loss to the U.S. in the strict sense, since they are set (according to current NOAA policy) at levels just sufficient to recover costs of management and enforcement of foreign fisheries.

B. Impacts on the Domestic Groundfish Industry

1. Harvesting Sector

American fishermen would benefit in two ways from the exclusion of foreign effort from the FDZ. The first is improved operating efficiency due to reduced competition for prime fishing grounds. "Improved operating efficiency" is defined here, for a fishing vessel, to mean an increase in the amount of fishing time available in a fixed-length season; or equivalently, a reduction in the amount of unproductive, non-fishing time which must of necessity be spent in handling gear, prospecting, running, offloading, etc. In the past, American skippers have voiced concern about foreign fleets moving onto the richest grounds and effectively preempting them, forcing domestic vessels to handle their gear more frequently and occasionally displacing them from the grounds. Increased competition from (and possible gear conflict with) foreign fleets reduces fishing time and requires more prospecting and moving of gear. Excluding foreign effort would, therefore, increase fishing time for the domestic fleet, given a constant season length; this can be expressed either as more hours fished per day or as more days fished per season.

Secondly, the productivity of effort of the U.S. fleet would improve. If there is a relationship between catch rates and total effort on a fish stock, then a change in effort will result in changed catch rates. Since the marginal productivity of effort is generally expected to decline as effort increases, the expected effect of excluding foreign effort would be to increase marginal catch rates for the domestic fishing effort. This increase would be transitory, since higher catch rates will encourage additional U.S. trawl effort to move in. The benefits to harvesters of enhanced catch rates and improved operating efficiency may be illustrated by examining operating profiles of vessels which represent the majority of the current and expected future bottomfish fleet.

Groundfish processing capability in the Bering Sea now consists primarily of joint-venture processors accepting pollock deliveries, though recently several shore-based plants in the Akutan area have committed to processing Pacific cod. Several domestically-owned at-sea processors plan to accept cod, but have yet to take deliveries in any significant quantities. (No plans currently exist for development of shore-based facilities for pollock). Thus, three distinct kinds of operations in the FDZ area are currently underway or projected to begin in the near future: at-sea delivery of cod, shore-side delivery of cod, and at-sea delivery of pollock.

Target species, delivery mode, and vessel size are primary determinants of economic performance in a groundfishing operation. With a low-valued species such as pollock as the target species, tremendous volumes are needed to reach the breakeven point. High daily catch rates and a high proportion of fishing days per season are needed. These requirements make the opportunity costs of transit time significant in the breakeven calculations and favor development of at-sea processing for low-valued species. At-sea deliveries cost the catcher vessel less than shore-side deliveries, primarily because transit time and handling of the catch are reduced [see Jaeger (1977), Philbin (1978), or Lynde (1981)].

Given that the catch which will become available if foreign effort is excluded from the FDZ is predominantly (87%) pollock, and that there are no shore-based plants which currently accept pollock deliveries, the main groundfish activity

in the FDZ will probably be domestic vessels fishing pollock for foreign processors. Therefore, harvester benefits will be discussed in terms of pollock joint ventures.[1/]

Table 4 presents economic data for three different classes of vessel expected to represent the future bottomfishing fleet,[2/] which is estimated to consist of 32% smaller shrimp-style vessels, 43% small Bering Sea crabbers, and 25% higher-powered crabbers. The primary advantage of the smaller boat is lower costs of operation, while the larger boats can fish in more marginal weather conditions and tow a larger net. (Hold capacity does not limit joint venture operations, since the codend is transferred directly to the processor.) Fleet averages are based on the performance characteristics of the representative vessels weighted by their expected proportion in the groundfish fleet.

In Table 4, the "representative" weighted average vessel (based on the column) will fish 10 hours/day for 151 days and catch 3.8 mt/hour trawled. The average vessel's gross earnings will be $763,808. After subtracting non-labor and labor costs ($486,004 and $212,375 respectively) from the gross earnings, the average net cash flow is $65,429. This net cash flow is used as a basis for illustrating the benefits that will accrue to U.S. fishermen from creation of the FDZ.

A detailed analysis of how improved catch rates and operating efficiency will enhance the average vessel's net cash flow has been placed in Appendix 1. Two cases are examined: (1) catch per unit effort is increased by 0.3 mt/hour, or

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1/ This is not to imply that benefits will not accrue to cod fishing operations. There is just no information available on directed cod fisheries in the FDZ. If catch rates do increase, it will confer benefits similar to those identified for the pollock joint venture fishery, but without information it is not possible to assess whether catch rates for cod will be affected.

2/ Much of this analysis is based on the performance profiles presented in Army Corps of Engineers (1982), a detailed study of the microeconomics of joint venture harvesting of bottomfish undertaken in a feasibility study of constructing a harbor in St. Paul, Alaska.

TABLE 4. Annual Operating Profiles for Bering Sea Groundfish Vessels in Joint Venture Operation[a/]

Vessel Type and Size	Shrimp-Style Vessel (85')	Small Bering Sea Crabber (110')	Larger Bering Sea Crabber (120')	"Representative" Vessel (Weighted Average)
Fleet Composition (%)	32	43	25	--
Fishing Days	145	154	154	151
Hours Trawled/Day	10	10	10	10
Catch Per Hour Trawled (mt)	3.0	4.0	4.5	3.8
GROSS EARNINGS	575,505	814,968	916,839	763,808
(Expendables)	124,980	194,374	219,177	178,369
NON-LABOR COSTS				
Fixed	149,551	263,687	270,380	228,837
Variable	156,660	260,674	379,785	257,167
TOTAL NON-LABOR COSTS	306,211	524,361	650,165	486,004
LABOR PAYMENTS (Total Crew Share)	139,663 (.31)	235,828 (.38)	265,112 (.38)	212,375 (.363)
TOTAL COSTS	445,874	760,189	915,277	698,379
NET CASH FLOW[b/]	129,631	54,779	1,562	65,429

Source: Army Corps of Engineers (1982).

a/ This table uses the basic data and relationships in the Army Corps' report, but differs in its presentation in two major ways:

(1) The weighted average price used was lower ($132.30 per mt vs. $201), to reflect differences between current prices for the species mix in the foreign FDZ catch vs. projected future prices;

(2) The proportion of gross earnings (less expendables) paid to crew is slightly higher to reflect a higher captain's share.

b/ NET CASH FLOW is the balance remaining after payment of out-of-pocket costs. Depreciation and the Opportunity Costs of Capital are not included in this calculation.

roughly 8%, with no change in operating efficiency; and (2) operating efficiency (defined in the example as hours fished per day) is increased by 0.6 hours/day, or about 6%, with no change in catch per unit effort.

The analysis shows that compared to the base case net cash flow of $65,429, higher catch rate increases this amount to $100,491, and higher operating efficiency increases it to $79,667. Compared to the base case, added net benefits are $55,261 for increased catch rate and $25,248 for increased efficiency. Thus, in this example, increased efficiency had about half the effect of increased catch rate on net benefits resulting from implementing an FDZ, because costs of operation increase with increases in operating efficiency but do not increase with enhanced catch rates.

How price affects net benefits to fishermen has not been discussed and an extensive analysis is beyond the scope of this paper. Though Appendix 1 contains an example of how net benefits might change, the absolute level of net benefits, during and after the change in operating efficiency or catch rates, will depend on price. However, the relationship between the benefits of improved catch rates (which equal the increased gross earnings) and of improved operating efficiency (which is less than the gross earnings increase) does not. Generally, if the creation of the Fishery Development Zone increases catch rates or operating efficiency for U.S. fishermen, net benefits will increase if processor demand for raw product is price elastic. Price effects of the establishment of the FDZ may be negligible, since the models of catch and effort elaborated below predict a fairly small increase (6.5-10.5%) in U.S. joint venture catch.

The difficulties with the analyses in Appendix 1 are twofold: first, we don't know whether the FDZ would cause catch rates or operating efficiency to increase by 0.5%, 5%, or 50%; and second, there is no mechanism for readjustment. If the FDZ causes an increase in catch rates or an increase in operating efficiency, we know they can't last forever. If, for example, catch rates in the FDZ were to rise because of the removal of foreign effort, this would provide a financial incentive for other (American) vessels to enter. At some point, enough new effort would enter so that expected catch rates would return to an equilibrium; that is, they would return to being approximately

equal everywhere. The "what-if" analyses in Appendix 1 beg the question of how long the increases (in catch rates or operating efficiency, or both) would last, and, consequently, what the total benefits of the FDZ are.

In an effort to overcome these limitations, trends in existing data on catch and effort for the FDZ area were examined. This, of necessity, focused primarily on Japanese fleet data, since effort statistics are not collected for American vessels, and the bulk of the foreign fishing in the area was by Japanese fleets.

(a) The Estimated Relationship Between Catch and Effort in the FDZ

The response of catch to changes in effort is influenced by numerous factors, from basic conditions of stock abundance and natural mortality to interactions of effort intensity between fleets fishing the same stocks. Though it is difficult to isolate the effects of each factor, catch generally can be expected to increase with effort until limited by sustained availability of resource or regulated quota. Limited resource availability will be reflected in lower catch rates as the season progresses and effort accumulates.

Foreign fisheries catch and effort data were analyzed to determine areal and seasonal variations in catch rates. First, the most productive tows of the foreign fleet in 1979 and 1980 were compared by location and season (Appendix 2). Mean catch rates for pollock and Pacific cod varied seasonally but were not significantly different by location. Therefore, mean catch rates inside the proposed FDZ are concluded to be similar to those recorded for the surrounding waters.

However, catch rates for the foreign fleets did show a definite seasonal pattern. This seasonal pattern was examined more closely using Japanese catch and effort data for June-November for each of three years, 1979 to 1981 (see Table 5). The foreign trawl fishery was restricted to those six months by regulations set for the Winter Halibut Savings Area. Figures 2 and 3 show that catch rates increased steadily with effort from June through July and August, or until cumulative effort reached 3,000-5,000 hours trawled and cumulative catch reached 15,000-25,000 mt. Catch rates then began to level

TABLE 5. Catch and Effort of the Japanese Fleet in the FDZ, 1979-81

Year	Month[a/]	By Month		Season Cumulative	
		Catch (mt)	Effort (hrs)	Catch (mt)	Effort (hrs)
1979	June	1,600.4	449	1,600.4	449
	July	8,945.5	1,713	10,545.9	2,162
	Aug.	15,015.8	1,963	25,561.7	4,125
	Sept.	16,031.9	2,100	41,593.6	6,225
	Oct.	7,490.9	3,899	49,084.5	10,214
	Nov.	1,599.0	2,476	50,683.5	12,600
1980	June	426.0	465	426.0	465
	July	3,700.3	425	4,126.3	890
	Aug.	10,636.2	1,626	14,762.5	2,516
	Sept.	15,962.2	2,503	30,724.7	5,019
	Oct.	5,729.3	1,736	36,454.0	6,755
	Nov.	7,392.4	2,867	43,846.4	9,622
1981	June	123.2	337	123.2	337
	July	1,518.9	457	1,642.1	794
	Aug.	9,589.5	1,781	11,231.6	2,575
	Sept.	12,670.3	2,537	23,901.9	5,112
	Oct.	18,751.6	3,858	42,653.5	8,970
	Nov.	13,549.6	4,906	56,203.1	13,876

Source: Japan Fisheries Agency. This summary taken from personal communication between Donald P. Swisher and Jim H. Branson, September 1982.

a/ The FDZ is part of the Winter Halibut Savings Area, which is closed to foreign trawling six months of the year.

FIGURE 2. Catch and Effort of the Japanese Fleet Fishing in the FDZ, 1979-81

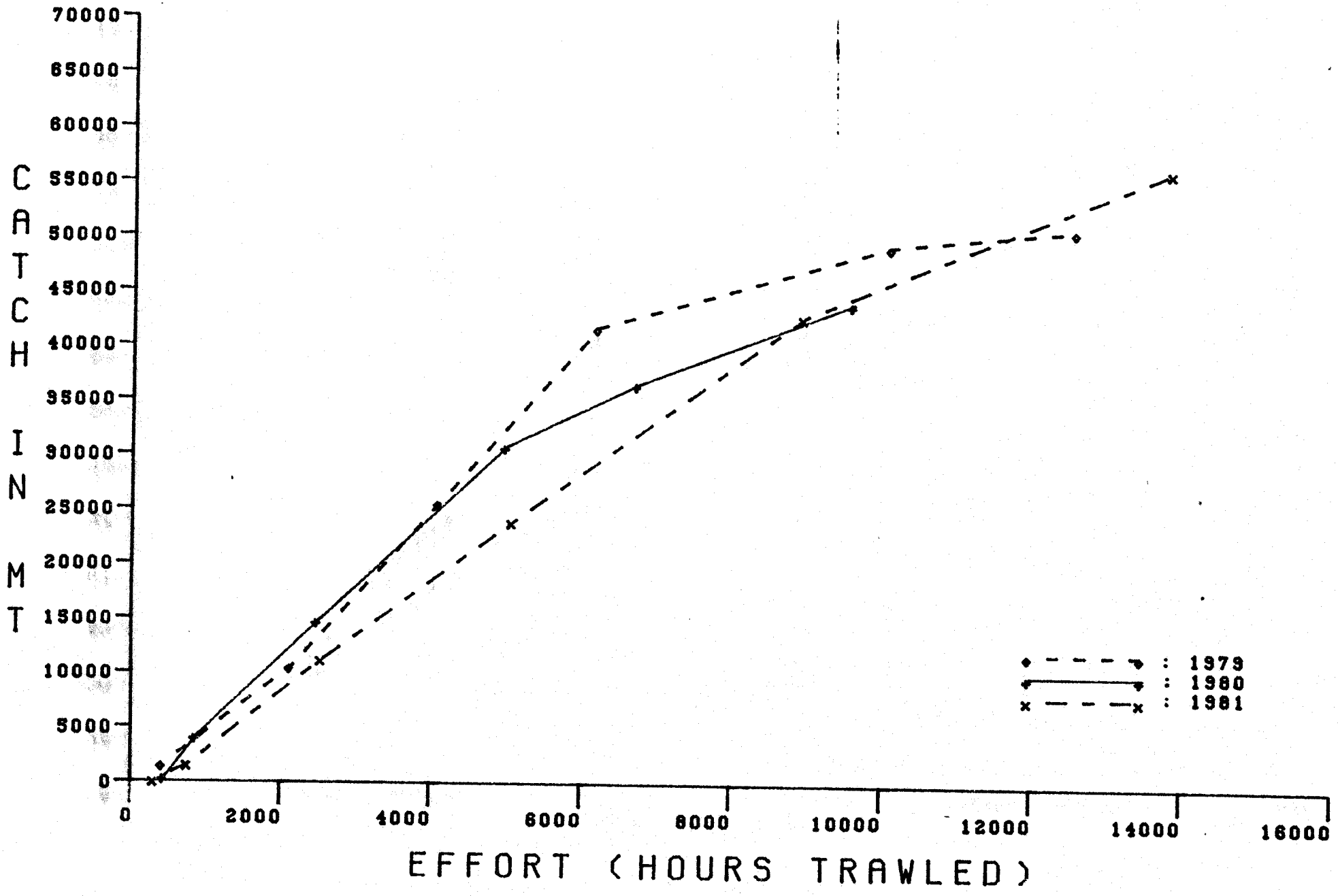
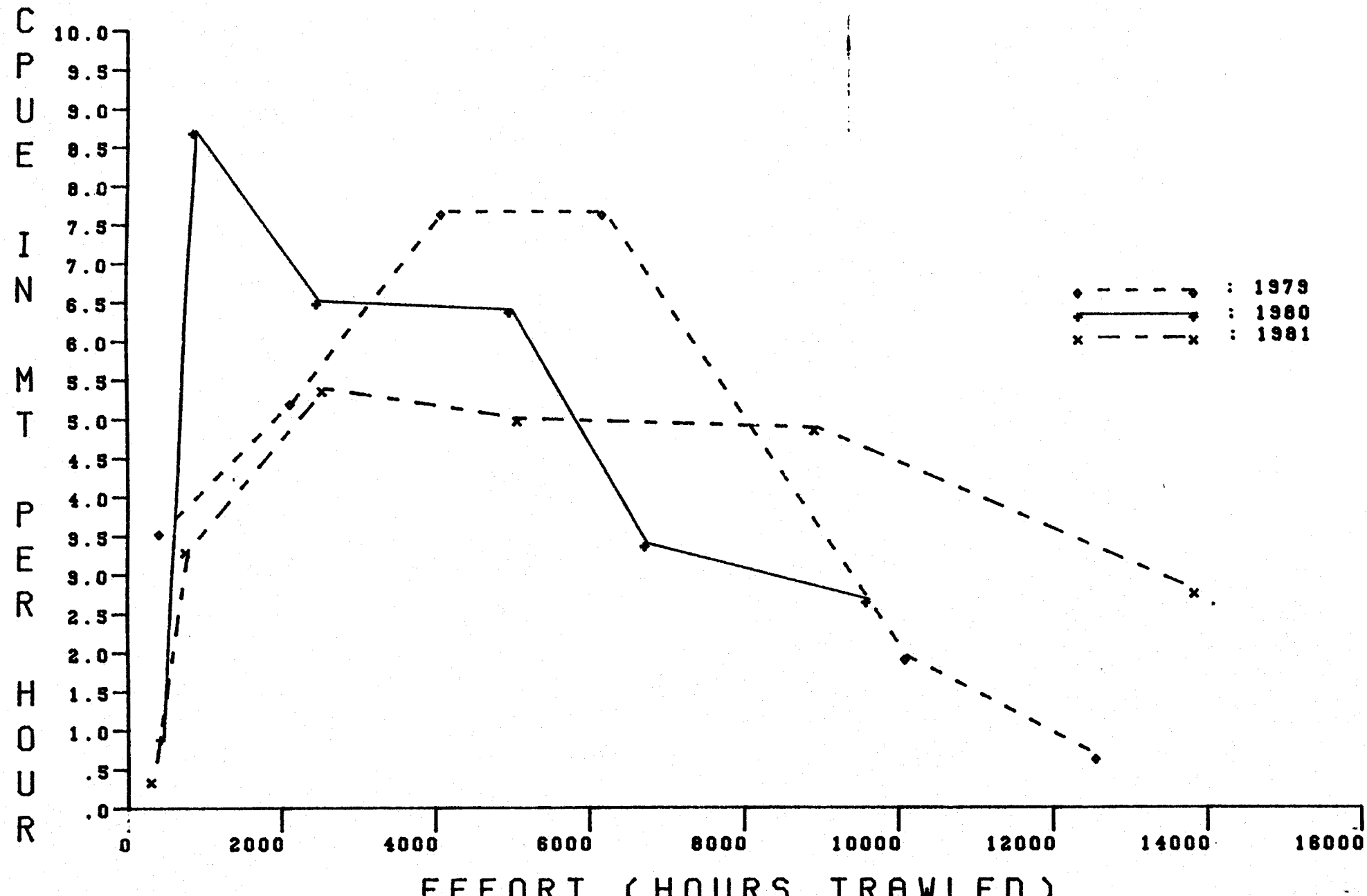


FIGURE 3. Catch Per Unit Effort and Effort of the Japanese Fishing Fleet in the FDZ, 1979-81



off at 5-9 mt/hour, then declined to less than 3 mt/hour, suggesting that resource availability became limiting.

This decline in catch rate at higher effort is predicted by most simple fisheries models which use a Schaeffer or logistic population growth function to derive the relationship between catch and effort. A logistic function was fitted to the three data sets using Ordinary Least Squares regression to determine goodness-of-fit. The asymptote was chosen by inspection rather than iteratively, which means that parameter estimates may be less robust than if the asymptote was chosen by an optimization technique. Goodness-of-fit was also determined for a linear function on all three data sets.

The results of the tests for the three years indicate that a logistic function describes the catch-effort relationship better than a straight line (Table 6). The difference in goodness-of-fit was greatest for 1979 and least for 1981 (Figures 4 and 5). The predictive power of the two models is illustrated in Table 7 by comparison of estimated and observed catch and catch rates at various effort levels. Catch was predicted better by the logistic model fourteen of eighteen times. The same model predicted catch rate better twelve of eighteen times. The Japanese catch data represent over two-thirds of the foreign catch from the FDZ area. Therefore, the logistic catch-effort relationships described for 1979-81 are assumed to adequately characterize general groundfish fishery operations in the area.

The better statistical performance of the logistic function provides empirical evidence that catch rates in the FDZ decline at higher levels of effort. This suggests that a reduction of effort would cause catch rates at the margin to increase. It also provides a means for estimating how much of an increase in catch rates would occur with a given reduction in effort in the FDZ area, and how the system would re-equilibrate as the financial incentive of temporarily higher catch rates attracted new effort to the area. Eventually, of course, the new effort in the FDZ area would cause catch rates to equalize, but until that occurred the new effort would be achieving higher catch rates and, therefore, lowered costs of production. The reason this is of significance to American interests is that the effort being reduced by the proposed FDZ is foreign effort, and it is American effort which would be attracted into the FDZ by temporarily higher catch rates and lower costs of production.

TABLE 6. Catch-Effort Relationships for the Japanese Fleet Operating in the FDZ, 1979-81

Functional Form	Year	Dependent Variable	Intercept Term	Coefficient of Independent Variable: hrs	Coefficient of Independent Variable: ln hrs	R^2
Logistic	1979	$\ln\left(\frac{C}{52{,}000-C}\right)$	-16.967		2.117*** (0.241)	0.951
	1980	$\ln\left(\frac{C}{48{,}000-C}\right)$	-17.467		2.136*** (0.148)	0.981
	1981	$\ln\left(\frac{C}{72{,}000-C}\right)$	-17.307		1.956*** (0.114)	0.987
Linear	1979	C	4,983.005	4.180*** (0.700)		0.899
	1980	C	1,139.895	4.888*** (0.491)		0.961
	1981	C	-30.292	4.293*** (0.258)		0.986

(standard errors in parentheses under coefficients)

***: significant at 99% confidence level

Variable definition: C = catch in mt
hr = hours trawled

FIGURE 4. FDZ Catch and Effort of the Japanese Fleet in 1979: Predictions of Selected Models vs. Actual Data

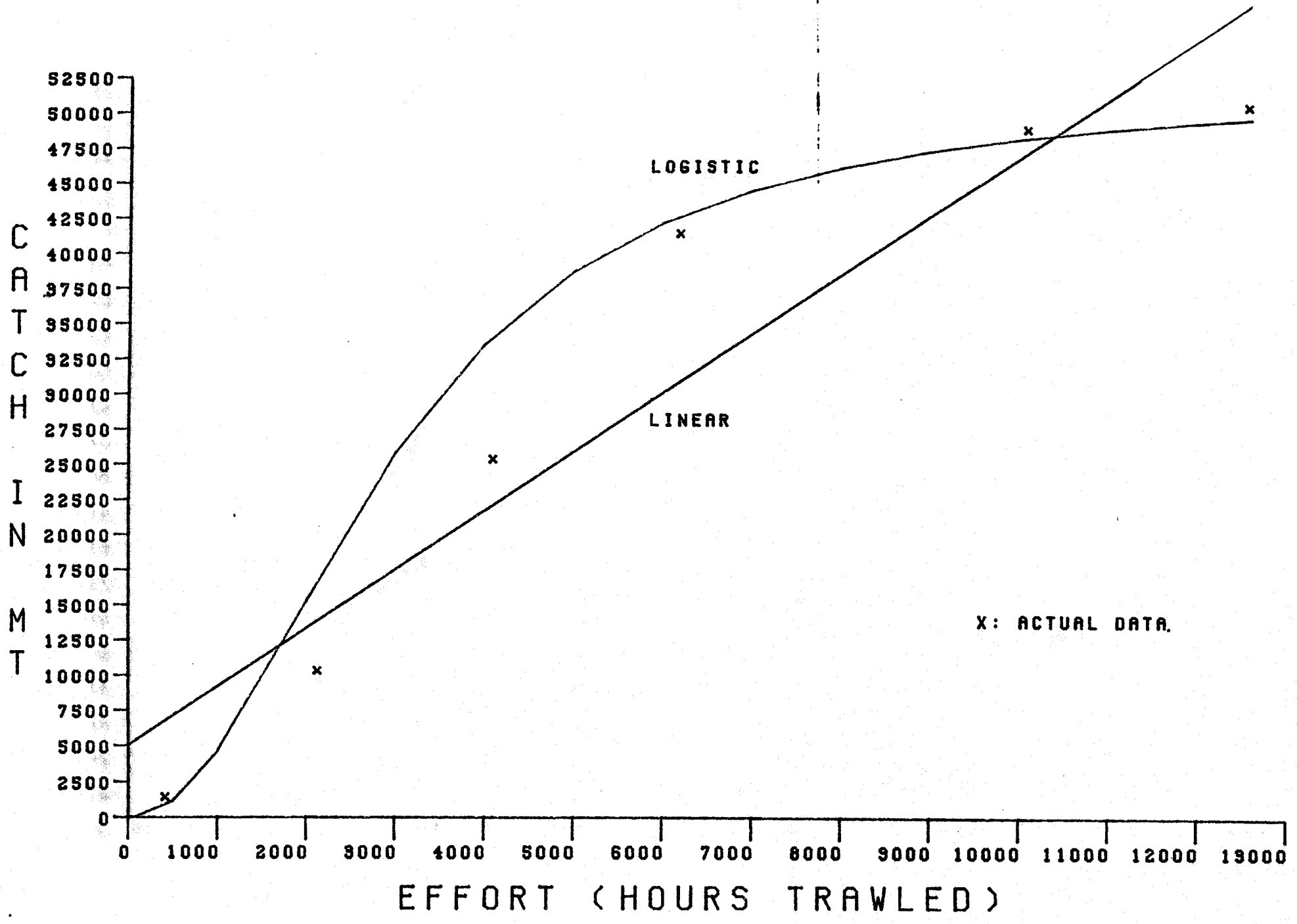


FIGURE 5. FDZ Catch and Effort of the Japanese Fleet in 1981: Predictions of Selected Models vs. Actual Data

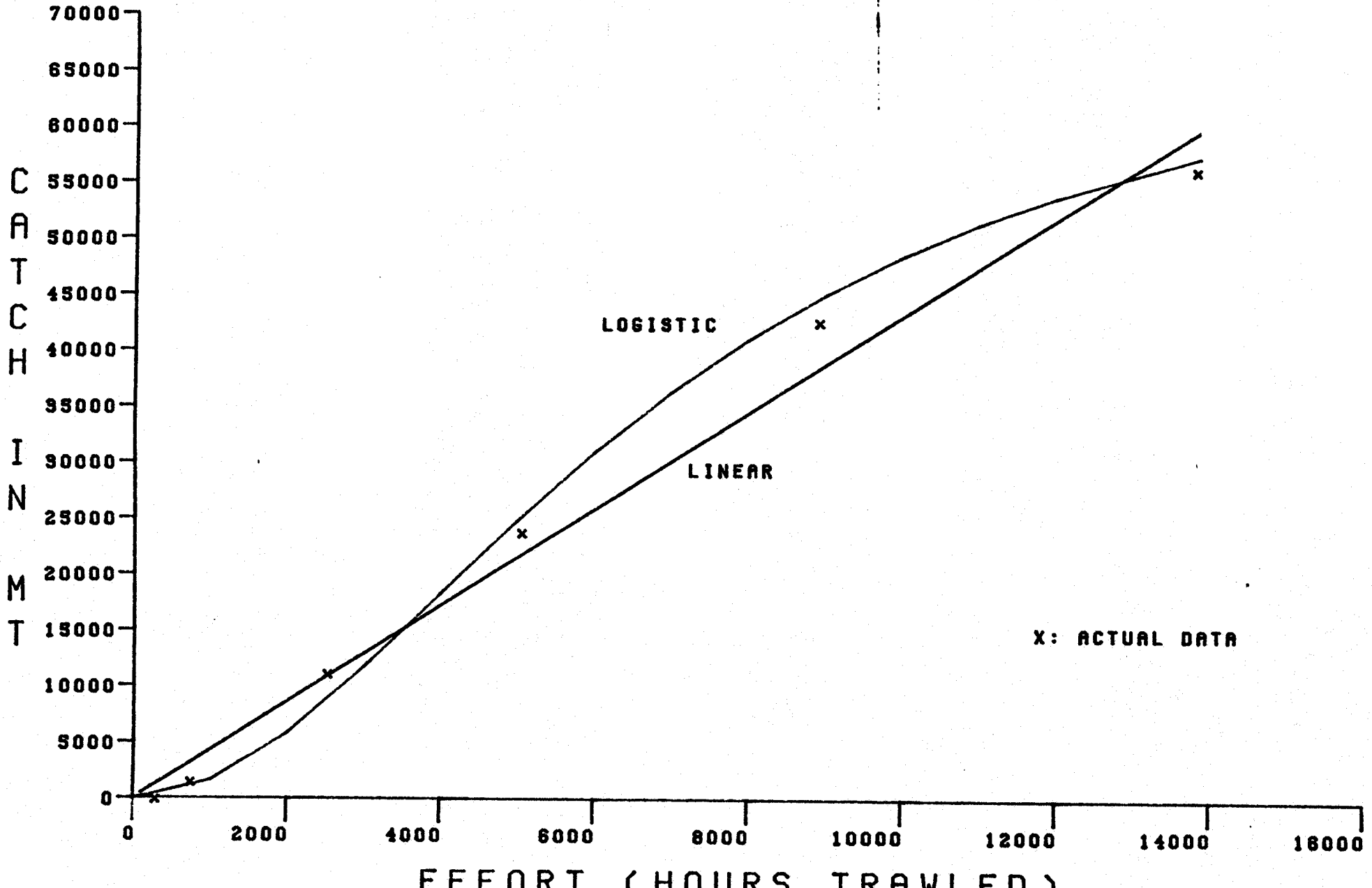


TABLE 7. Predictive Power of the Linear and Logistic Models

		True Values		Logistic Model		Linear Model	
Year	Effort	Catch	$\frac{\Delta C}{\Delta E}$ [a/]	$\hat{C}$ (mt)	$\frac{d\hat{C}}{dE}$ (mt/hr)	$\hat{C}$ (mt)	$\frac{d\hat{C}}{dE}$ (mt/hr)
1979	449	1,600	3.56	900*	4.17*	6,860	4.18
	2,162	10,546	5.22	17,120	11.24	14,020*	4.18*
	4,125	25,562	7.65	34,234	6.02*	22,226*	4.18
	6,225	41,594	7.63	42,722*	2.59	31,129	4.18*
	10,124	49,085	1.92	48,257*	0.73*	47,301	4.18
	12,600	50,684	0.65	49,580*	0.39*	57,651	4.18
1980	465	426	0.92	614*	2.78*	3,413	4.89
	890	4,126	8.71	2,366	5.40*	5,490*	4.89
	2,516	14,763	6.50	15,506*	8.91	13,438	4.89*
	5,019	30,725	6.38	32,444*	4.47	25,673	4.89*
	6,755	36,454	3.38	38,270*	2.45*	34,158	4.89
	9,622	43,846	2.65	42,879*	1.02*	48,172	4.89
1981	337	123	0.37	192*	1.11*	1,416	4.29
	794	1,642	3.32	1,015*	2.46*	3,378	4.29
	2,575	11,232	5.38	8,995	5.98*	11,024*	4.29
	5,112	23,902	4.99	25,425*	6.29	21,916	4.29*
	8,970	42,654	4.86	44,723*	3.69	38,478	4.29*
	13,876	56,203	2.76	57,151*	1.66*	59,539	4.29

*closest to true value

a/ This measures a discrete change, so is not directly comparable with the first derivatives, which measure instantaneous rate of change.

The advantage of this model is that it provides some basis for concluding how much of an increase in catch rates would occur if the FDZ is implemented, and what the total benefit to American fishing interest would be. It must be emphasized, however, that while we can identify a conceptual model which explains what is likely to occur if the FDZ is implemented, there are some potentially significant limitations to the data available, which hamper efforts to provide precise quantitative estimates. Chief among these is the fact that the catch-effort models are simple univariate models, and thus are incapable of reflecting the effects of other variables besides foreign effort which may affect the foreign catch rate. These variables might include American effort, weather conditions, or stock conditions. Thus, it is possible that the foreign effort variable in the existing models may, in part, be reflecting movements of some of these other influences, though there is some reason to believe their effects are minimal. Each will be discussed briefly.

No data is collected on American effort. A preferred statistical model would express American catch in the FDZ as a function of American effort and foreign effort. Then, as foreign effort was removed, the effects on the American catch-effort relationship could be predicted. However, this relationship cannot be estimated because of the lack of data on American effort. For a similar reason, American effort cannot be included as a shift variable in the relationship which was estimated between foreign catch and foreign effort.

If we consider two fleets in the FDZ, a foreign fleet and an American fleet, we would expect that increasing effort by one fleet would lower the catch-effort relationship by the other fleet. A concern, then, is whether the "tailing off" of foreign catch rates at the end of the season is really reflective of a biomass relationship or due to the effects of greater American effort then, shifting the foreign catch-effort curve downward.

There are two reasons why the effects of American effort probably cannot account for the "tailing off" phenomenon. First, the level of American effort in the FDZ area has been relatively low, as catches of American fleets (1981-82 average joint venture catch was 15,565 mt, plus some smaller amount that was domestically processed) compared with foreign fleets (1977-80 average

catches were 73,046 mt) indicate. Second, and more importantly, virtually all of the American catches occur in the early part of the foreign fishing season, from June-August. Thus, if American effort were responsible for any bias in estimation, it is likely that the true "tailing off" of foreign catch rates would be even more dramatic than the current model indicates.

Worsening weather conditions could decrease catches, because it adversely affects operating efficiency, or the amount of time that can be spent fishing. However, as will be developed in the next section, Japanese vessels in particular have excess capacity which is primarily designed to minimize the influence of weather on their fishing operations. Thus, a case can be made that variations in catch rate for the Japanese fleet reflect the biomass-constrained catch-effort relationship, instead of the effects on operating efficiency of worsening weather, since the vessels are designed to reduce weather disruptions.

Stock conditions (such as recruitment) or environmental factors could make a large difference in the relationship between catch and effort. It is precisely for this reason that catch-effort relationships were estimated separately for each of the years 1979, 1980, and 1981. This removes the concern that year-to-year fluctuations in biomass are affecting the catch-effort relationship. Within each season, catch rates were observed to decline at increasing effort levels. Stock conditions, therefore, are recognized in the way the model was estimated, and are not an omitted variable which could obscure the true catch-effort relationship.

None of the factors just mentioned (American effort, weather, or stock conditions) is a likely reason for the decline in catch rates at higher levels of effort, and (hence) the better performance of the logistic model. Nonetheless, it remains that the catch-effort relationships are simple and do not account for other influences. Aside from the simplicity of the statistical models, effort is a difficult variable to measure meaningfully. Two identical vessels with the same number of crew can be different in fishing power (because of the differences in the skipper's skill, for example), and thereby exert different fishing effort even if they fish the same number of hours. The effort data used here are unstandardized with respect to fishing power. The Japanese

fleet in the FDZ consisted predominantly of large trawlers and small trawlers; for each vessel class separately, and for standardized data for the whole fleet, the trend toward declining catch rates was clear in two of the three years 1979-81. For simplicity, the unstandardized data were used, but the empirical results may have differed somewhat if the effort data in another form had been used.

The uncertainties inherent in the available data require that the quantitative estimates of benefits and costs be viewed as illustrative of the kinds of effects that would be expected with the proposed FDZ. It is not appropriate to view them as being particularly precise, but they should be indicative of the directions of impact and of the magnitudes involved.

(b) Predicted U.S. Activity in the FDZ

The preferred model of catch and effort implies that the exclusion of foreign fisheries from the Fishery Development Zone will reduce effort and increase catch rates for U.S. groundfish fishermen in the zone. Catch rates increase as a result of the logistic relation between catch and effort developed above. As illustrated in Table A-1 (Appendix 1), increased catch rates will result in higher net benefits from the fishery, but also will encourage effort to move into the zone. As U.S. activity expands, catch rates will decrease accordingly.

Estimates of future U.S. effort and catch in the FDZ are based on three assumptions. First, prices offered to Americans for groundfish harvests are assumed not to change as a result of implementing the FDZ. Unrelated price fluctuations may occur, but should affect gross earnings in all areas equally and thus will not materially change net benefits of the FDZ to U.S. fishermen. If the FDZ does reduce prices, then net benefits will have been overstated.[3/]

3/ To reduce estimated net benefits to zero, the price decline attributable to creation of the FDZ would have to be $16-44 per mt, or a drop of 12-33% (see cost of production estimates in Table 12). Because most of the FDZ catch will be sold to foreign processors and any increased catch will be small compared to the quantities extracted from the Bering Sea, price declines of this magnitude probably will not occur.

Second, U.S. catch rates are assumed to be in equilibrium throughout the Bering Sea. Without impediments to movement, effort will shift so as to equalize marginal catch rates.[4/]

Third, foreign and American units of effort are assumed to be equivalent in productivity. This may seem tenuous, because foreign trawlers are larger and have substantially greater horsepower than U.S. trawlers. However, foreign companies intentionally create overcapacity in their fleets, primarily to increase the number of fishable days per season. The primary difference between the foreign and American catcher vessels is that while Americans can match the hourly and daily catch rates of foreigners, their size prevents them from fishing as many days per season. Thus, size affects operating efficiency, rather than catch rates, and the effort exerted by the American and foreign fleets can be considered roughly comparable in terms of daily yield, although foreign trawlers can exert more effort per season than American trawlers.

Experience with pollock joint venture fishing supports this contention. The average daily production rate by American vessels delivering to Japanese processors in 1982 was 75 mt (Takeuchi, 1982). This compares favorably to daily production rates by foreign fleets operating in the Southeastern Bering Sea and Western Gulf of Alaska.

Japan Fisheries Agency data for Japanese fleets operating in the FDZ in 1979-1981 indicate that overall average daily production ranged from 31-36 mt/vessel day, while average daily production by large trawlers ranged from 37-52 mt/vessel day. Data collected by the NMFS Observer Program and summarized in Smith et al. (1981) show that for 1980 the average catch in the Southeastern Bering Sea and Western Gulf by foreign fleets which target on

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4/ The expected yield of the last unit of effort expended by a boat should be approximately equal (accounting for the transit time from present location to new grounds) in all areas; if the expected yield were higher in some other area, it would be rational to relocate, lowering marginal catch rate in the new area slightly and raising it in the old area. Though it would not necessarily have to occur, the data in Tables A-2a and A-2b (Appendix 2) suggest that the average catches were equal, too.

pollock was about 60 mt/day. Daily catches by surimi trawlers (averaged by quarter) ranged from 48-91 mt, with an overall mean of 87 mt, while average daily catches by large trawlers (again, broken down by quarter) ranged from 33-59 mt, with an overall mean of 41 mt.

These comparisons of daily catch, while only approximate, suggest that productivity of American effort should not be significantly lower than that of the Japanese fleet. Even assuming that in 1982 American vessels trawled an average of 15 hours per day (which is probably at least 50% too high), the season average American catch rate was 5 mt/hour trawled. This contrasts with season average Japanese catch rates in the FDZ of 4.02-4.56 mt/hour trawled for 1979-1981 (Table 5). Using a more probable estimate of 10 hours trawled per day for American vessels, the resulting average catch rate of 7.5 mt/hour trawled is in the same range as peak monthly average catch rates by the Japanese fleet in the FDZ, which varied from 5.38-8.71 mt/hours trawled in June and July of each year (Table 7).

Even though the productivity of American vessels is adequate, a major concern of the Japanese processors is that because of their small size, American trawlers are unable to fish in inclement weather, and they have more down time (compared to Japanese vessels) because of an inability to make certain repairs (Takeuchi, 1982). Thus, it is in the operating efficiency, or number of hours trawled per season, where the greatest difference between Japanese and American vessels occurs. For purposes of this analysis, however, it is necessary only to assume that productivity of effort is equivalent.

Table 8 shows catch rates in the FDZ predicted at various effort levels using the logistic relations derived earlier from Japanese data (see Table 6). The FDZ will exclude foreign effort and therefore increase catch rates. For example, if effort in 1981 had been reduced to 8,000 hours, the marginal catch rate would have been 4.32 mt/hour.[5/] Had it been reduced to 4,000 hours, the marginal catch rate would have been 6.65 mt/hour. Since these catch rates are higher than the actual marginal catch rates for 1981 (2.76 mt/hour), had

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5/ That is, the catch for the 8,001st hour would have been 4.32 mt.

TABLE 8. Estimated Foreign Catch and Catch Per Unit Effort in the FDZ, 1979-81.

Fleet Effort (hrs)	1981 Catch (mt)	1981 Marginal Catch Rate (mt/hr)	1980 Catch (mt)	1980 Marginal Catch Rate (mt/hr)	1979 Catch (mt)	1979 Marginal Catch Rate (mt/hr)
1,000	1,581	3.02	2,993	5.99	4,552	8.79
2,000	5,768	5.19	10,856	8.97	15,282	11.42
3,000	11,622	6.35	19,699	8.28	25,763	9.17
4,000	18,183	6.65	26,989	6.31	33,465	6.31
5,000	24,717	6.35	32,359	4.50	38,652	4.20
6,000	30,780	5.74	36,159	3.18	42,113	2.83
7,000	36,170	5.03	38,847	2.26	44,467	1.95
8,000	40,841	4.32	40,777	1.64	46,112	1.38
9,000	44,833	3.68	42,189	1.21	47,293	1.01
9,622[a/]	--	--	42,879	1.02	--	--
10,000	48,222	3.11			48,165	0.75
11,000	51,091	2.64			48,823	0.57
12,000	53,524	2.24			49,330	0.45
12,600[a/]	--	--			49,580	0.39
13,000	55,991	1.93				
13,876[a/]	57,151	1.66				

a/ These are the actual effort totals for each season: 9,622 hours trawled in 1980, 12,600 in 1979, and 13,876 in 1981.

effort in fact been restricted to 4,000 hours, there would have been an incentive for vessels to fish less in other areas (at 2.76 mt/hour) and redirect some of their effort toward the FDZ, where these first hours of effort would yield catches of as much as 6.65 mt/hour. The effect of this effort redistribution would probably be to lower marginal catch rates in the FDZ, while causing those rates to increase slightly outside the zone. [6/] Continuing with the example, had the incentive provided by higher expected catch rates in the zone resulted in an increase of 1,000 hours effort in the zone, marginal catch rate would fall from 6.65-6.35 mt/hour, narrowing the difference between marginal catch rates inside the zone and those outside the zone. The reduced differential in expected catch rates would slow the movement of effort, and eventually an equilibrium of marginal catch rates would be achieved.

The higher catch per unit effort reduces the cost of production per metric ton of fish caught, since for a given level of effort (and cost) a greater catch results. The lower cost of production, with constant price, will increase the profit [7/] per metric ton. The difference in profit, or the difference in average cost of production per metric ton, times the tonnage landed, provides an estimate of the benefits to harvesters of creation of the FDZ.

The magnitude of the benefits to harvesters depends on the magnitude and duration of catch rate increases inside the FDZ, which in turn depends on what catch rates harvesters give up when they move to the zone. The opportunity cost of a unit of effort which moves to the FDZ is the gross earnings it could have earned by not moving to the zone, since the cost of a unit effort should be roughly equal regardless of where it fishes. Catch rates as they vary with effort inside the zone can be identified, but the costs of opportunities foregone by the effort entering the FDZ cannot be estimated precisely.

6/ The effect on catch rates outside the zone is somewhat uncertain because Low (1982) predicts that the foreign effort excluded from the zone will be redirected to areas outside the FDZ. This may cause a net increase in effort outside the zone and a decrease in catch rates.

7/ If all factors of production are paid, "profit" refers to pure economic rents. Here, benefits are measured by changes in average cost of production (given static price) rather than changes in pure economic rents.

However, opportunity costs may be approximated in the following manner. Using the initial equilibrium assumption, the marginal catch rates outside the FDZ are about 2.76 mt/hr. This "opportunity catch" would rise as American effort is diverted to the FDZ after the removal of the foreign effort.[8/] If the areas outside the zone are assumed identical to the FDZ in catch-effort response, to predict the opportunity costs of American effort, one could trace backward along the FDZ catch-effort function to estimate the effect of a reduction of, for example, 4,000 hours of effort outside the zone. Tracing forward along the same curve, the new American catch rates inside the zone can be estimated. Again, using 1981 as an example, a shift of 4,000 hours of American effort from outside the zone to inside the zone (after foreign effort is removed) would predict marginal catch rates of 6.65 mt/hr inside and 3.2 mt/hour outside the zone. Eventually, an equilibrium would be reached where marginal catch rates would be equal. Using the 1981 data, it appears that equilibrium effort in the FDZ would be about 6,500 hours.

This procedure could substantially overestimate the "opportunity catch," or catch outside the FDZ being foregone. This is because the catch outside was about 14 times the catch inside the zone, so the effort outside the zone was probably at least an order of magnitude greater. If the catch-effort relationships for stocks outside the zone were similar to those inside the zone, it would be better to use the inside-FDZ catch-effort curve to estimate the effects of a percentage reduction in effort, rather than an absolute reduction in effort, since the effort levels in the two areas are so disparate. That is, a 4,000-hour increase in effort in the FDZ would be about a 3% (4,000/138,760) decrease in effort outside the zone. Using the inside-zone catch-effort relation from Table 8, a 3% decrease in effort would imply marginal catch rates would increase about 8% (1.8 mt/hr / 1.66 mt/hr). Applying this to the actual 1981 marginal catch rate of 2.76 mt/hr, opportunity catches would rise to 2.99 mt/hr.

8/ Subject again to the effects of the increased foreign effort displaced from the zone. Assuming catch rates will rise outside the zone provides a more conservative net benefits estimate than assuming they will fall.

To insure that this analysis errs on the conservative side, benefits were estimated using substantially higher opportunity catch rates. For each year, a conservative benefit estimate was prepared using the actual season average catch rates as an opportunity catch rate (they were 4.05 mt/hr for 1981, 4.56 mt/hr for 1980 and 4.02 mt/hr for 1979). A second, less conservative (and probably more realistic) estimate was prepared using opportunity catch rates of about 0.5 mt/hr lower (3.5 mt/hr, 4.0 mt/hr, and 3.5 mt/hr, respectively). In each case, these were still higher than would be predicted by the equal-percentage-reduction procedure just described.

This discussion of opportunity costs and the equilibrium process for marginal catch rates is relevant to the prediction of how much effort will move into the zone, and what the ensuing catch will be. To estimate the benefits to harvesters, the average catch, or better yet, the average cost of production, can be used. What is the average cost of production of the predicted American FDZ catch versus the cost of production of the same tonnage had the FDZ not been created?

The balance sheet presented in Table 4 provides a basis for estimating cost curves for bottomfish production both inside the FDZ and elsewhere in the Bering Sea.[9/] There are three basic types of production costs: fixed costs (maintenance, insurance, etc.), which are incurred regardless of (and independent of) the levels of catch or effort; variable costs (such as fuel and gear repair), which are generally proportional to the amount of effort expended; and labor costs, which usually vary with the amount of catch. According to Table 4, the basic cost structure for a "typical" bottomfish vessel would be:

$$t = 228{,}837 + \frac{257{,}167}{(151)(10)} \cdot \text{hrs} + .363\left(c \cdot 132.3 - \frac{178{,}369}{(151)(10)} \cdot \text{hrs}\right)$$

$$= 228{,}837 + 170.31\ \text{hrs} + 48.02c - 42.88\ \text{hrs}$$

$$= 228{,}837 + 127.43\ \text{hrs} + 48.02c, \qquad (1)$$

where t is the total cost per vessel, hrs is the number of hours trawled, and c is the vessel's catch. The first term comprising t is fixed costs, the

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9/ The weighted average vessel figures are used for simplicity.

second is variable costs, and the third is labor costs, which are 36.3% of the difference between gross revenues and expendables. Following Army Corps of Engineers (1982), an ex-vessel price of $132.30/mt is used.

The number of vessel-seasons (defined as a vessel fishing a full season) required to harvest the full foreign FDZ catch in 1979, 1980, and 1981 is estimated as the total Japanese fleet effort in that year divided by 1,510, or the estimated hours an American vessel would trawl in a 151-day season at 10 hours/day. Thus, 12,600/1,510 ≐ 8.34 vessel-seasons would be required in 1979, 9,622/1,510 ≐ 6.37 would be needed in 1980, and 13,876/1,510 ≐ 9.19 vessel-seasons would be required in 1981.[10/]

Using this information and equation (1), the fleet cost curve can be calculated as:

$$N\,t = N\ (228{,}837 + 127.43\ \text{hrs.} + 48.02c)$$

$$T = 228{,}837N + 127.43\ HRS + 48.02C \qquad (2)$$

where, in (2), N represents the number of vessels, and T, HRS, and C are fleet aggregate total cost, hours trawled, and catch, respectively.

Equation (2) can be used to compute cost curves for the American fleet. Tables 9-11 present data from the cost curves for fishing inside the FDZ and outside the zone, under the two previously mentioned assumptions about opportunity catch. For this comparison, benefits of increased catch rates are defined as the total change in gross earnings (i.e., increase in owner's share and labor payments) instead of simply the increase in owner's share. Thus, in computing the cost curve for fishing inside the FDZ, labor was paid the same wages as could have been earned in fishing outside the zone. Since what could have been earned by labor outside the zone changes with the level of assumed

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10/ Fractional vessel-seasons may seem odd, but the 1979 figure of 8.34 could represent 8 vessels full-time and one vessel 1/3 time, or 25 vessels fishing 1/3 time in the FDZ. The primary significance of N is in the determination of the fleet aggregate fixed costs, since total cost is assumed to be linear in effort and catch.

TABLE 9. Estimated Average Cost/mt of Production for Bottomfish at Differing Levels of Aggregate American Effort, Using 1979 Catch-Effort Data

	Average Cost/mt of Bottomfish Production			
	Opportunity Catch = 4.02 mt/hr		Opportunity Catch = 3.5 mt/hr	
Catch (mt)	Inside FDZ ($/mt)	Outside FDZ ($/mt)	Inside FDZ ($/mt)	Outside FDZ ($/mt)
1,000	2,060.88	1,989.12	2,048.90	1,993.83
5,000	449.20	461.52	443.88	466.22
10,000	240.18	270.57	236.29	275.22
15,000	169.50	206.92	166.17	211.62
20,000	134.31	175.09	126.93	179.80
25,000	113.79	156.00	110.85	160.70
30,000	101.08	143.27	98.12	147.75
35,000	93.53	134.17	90.45	138.88
40,000	90.55	127.36	87.17	132.06
45,000	94.34	122.05	90.23	126.76
50,000	126.92	117.81	119.90	122.51
50,683.5	145.01	117.30	144.86	122.00

TABLE 10. Estimated Average Cost/mt of Production for Bottomfish at Differing Levels of Aggregate American Effort, Using 1980 Catch-Effort Data

	Average Cost/mt of Bottomfish Production			
	Opportunity Catch = 4.56 mt/hr		Opportunity Catch = 4.0 mt/hr	
Catch (mt)	Inside FDZ ($/mt)	Outside FDZ ($/mt)	Inside FDZ ($/mt)	Outside FDZ ($/mt)
1,000	1,657.85	1,534.05	1,642.36	1,537.96
5,000	380.71	367.50	373.80	371.41
10,000	211.32	221.68	206.24	225.59
15,000	153.74	173.07	149.36	176.98
20,000	125.40	148.77	121.33	152.68
25,000	109.53	134.19	105.56	138.10
30,000	100.82	124.47	96.77	128.38
35,000	97.80	117.52	93.44	121.43
40,000	102.26	112.31	97.15	116.22
42,879	112.32	109.87	106.25	113.78
43,846.4	118.70	109.12	112.07	113.03

TABLE 11. Estimated Average Cost/mt of Production for Bottomfish at Differing Levels of Aggregate American Effort, Using 1981 Catch-Effort Data

	Average Cost/mt of Bottomfish Production			
	Opportunity Catch = 4.05 mt/hr		Opportunity Catch = 4.0 mt/hr	
Catch (mt)	Inside FDZ ($/mt)	Outside FDZ ($/mt)	Inside FDZ ($/mt)	Outside FDZ ($/mt)
1,000	2,356.19	2,182.26	2,309.32	2,187.20
5,000	539.41	499.96	530.03	504.90
10,000	298.40	289.67	293.71	294.61
15,000	215.64	219.57	212.52	224.51
20,000	173.85	184.52	171.50	189.46
25,000	148.96	163.50	147.11	168.44
30,000	132.95	149.48	131.39	154.42
35,000	122.28	139.46	120.94	144.40
40,000	115.33	131.95	114.16	136.89
45,000	111.35	126.11	110.31	131.05
50,000	110.21	121.44	109.28	114.22
57,151	114.85	116.18	114.03	118.97

opportunity catch, the cost curve for fishing inside the FDZ shifts slightly when the assumed outside-FDZ catch shifts, as does the outside-FDZ cost curve. Figure 6 illustrates the cost curves for 1981.

Given an assumed opportunity catch rate, and the cost curves, the equilibrium catch and effort can be predicted, as well as the resulting harvester benefits. Table 12 presents these results for each of the two assumed opportunity catches in each of the years 1979-81. Using 1981 data, for example, if the opportunity catch is assumed to be 4.05 mt/hr, the predicted equilibrium American effort in the FDZ is 8,400 hrs. At that effort level, marginal catch rate in the FDZ is 4.05 mt/hr, FDZ catch is 42,515 mt, and the estimated average cost of production of that catch is $113.33 per mt. The estimated average cost of production of an equivalent tonnage, had not the FDZ been created, is $129.01. Cost savings to harvesters are estimated to be $666,000. The more conservative estimates are based on a higher initial opportunity catch for each year and range from the $666,000 just mentioned to $1,466,000, while less conservative estimates place the total benefit at $820,000 to $1,782,000 based on lower initial opportunity catches.

(c) Summary

In the above analysis, the basis for estimating benefits to harvesters was developed and elaborated.

The two primary sources of benefits to harvesters are expected to be improvements in operating efficiency, or the amount of time a vessel spends fishing in a fixed season, and improved catch rates. If there is a crowding problem in the FDZ because of competition between American and foreign vessels, removal of foreign effort will reduce it. It is possible to estimate how a given improvement in operating efficiency (from reduced crowding) will benefit American fishermen, but it is not possible to estimate how much American operating efficiency will improve with a reduction in foreign effort in the FDZ. Thus, it is not possible to provide a quantitative measure of this source of benefits.

FIGURE 6. Estimated Average Cost of Production for Various Levels of FDZ Catch, Compared With the Cost of Producing Comparable Tonnages in the Absence of the FDZ. (Using 1981 data and assuming opportunity catch is 4.05 mt/hr.)

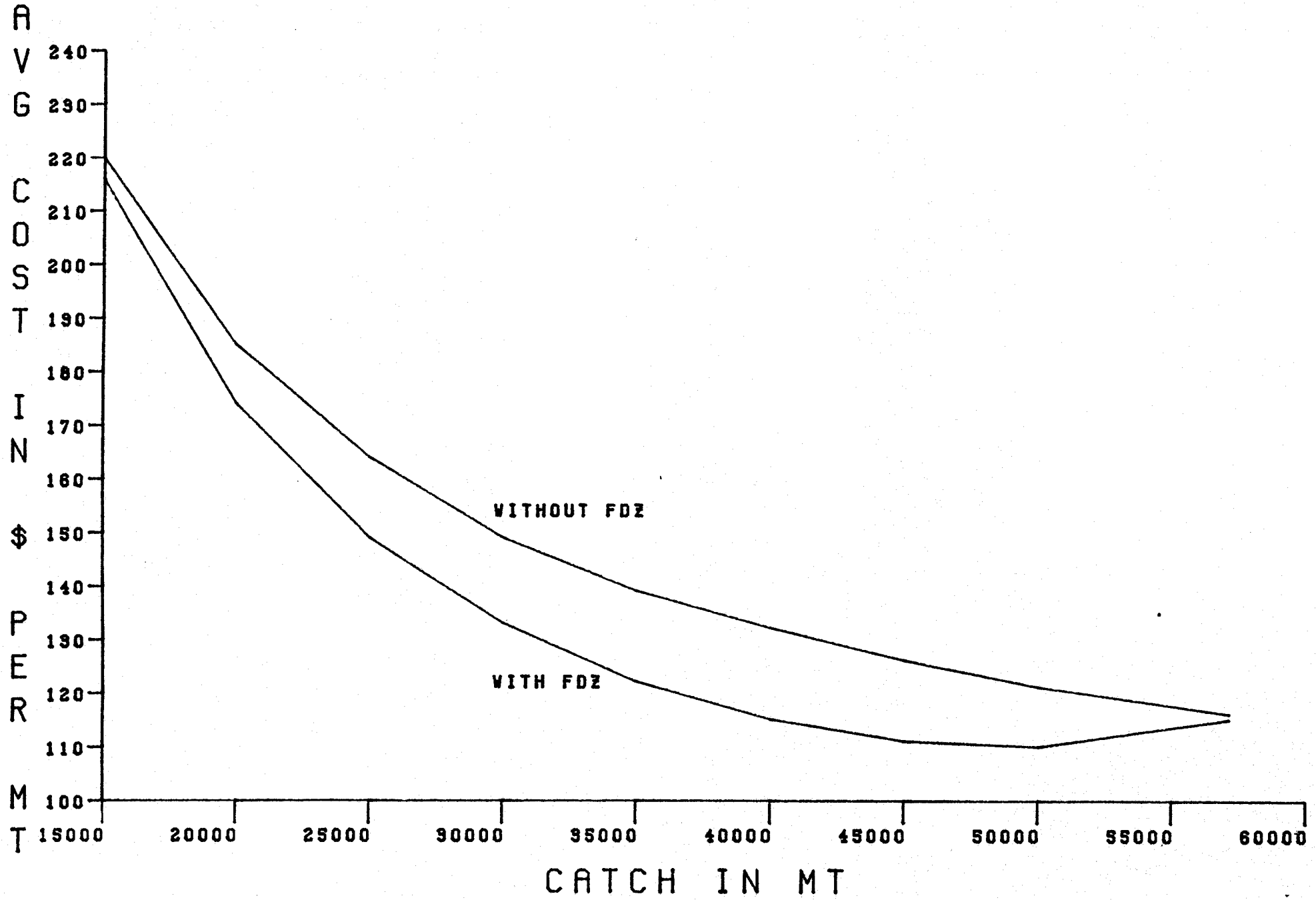


TABLE 12. Equilibrium Effort and Catch, Cost of Production, and Increase in Net Harvester Cash Flow after Creation of the FDZ, Under Different Initial Harvest Rates

Year	Initial Opportunity Catch (mt/hr)	Equilibrium Effort (hr)	Catch (mt)	Cost of Production ($/mt)		Increase in Net Harvester Cash Flow ($)
				Without FDZ	With FDZ	
1981	4.05	8,400	42,515	$129.01	$113.33	$ 666,635
1981	3.50	9,300	45,909	127.99	110.12	820,393
1980	4.56	4,965	32,200	121.41	99.94	691,334
1980	4.00	5,338	33,794	123.11	94.24	975,633
1979	4.02	5,109	39,100	128.59	91.09	1,466,063
1979	3.50	5,453	40,391	131.53	87.41	1,782,183

It is possible, however, to estimate the benefits to American fishermen of improved catch rates resulting from the removal of foreign effort from the FDZ. Catch-effort functions were fit to Japanese data from the FDZ in 1979-81 (Japanese catch was about two-thirds of the total FDZ catch). It was found that a logistic function fit the data better than a linear function, which demonstrated (as would be expected a priori) that catch per unit effort varies with the level of effort expended.

The empirically-demonstrable fact that catch rates vary with effort is used to estimate benefits accruing to American fishermen. The preferred catch-effort model predicts that catch per unit effort will increase as foreign effort in the FDZ is reduced. Removal of foreign effort will create a catch-rate differential between the FDZ and nearby areas, and a financial incentive for American effort to move into the zone. The higher catch rates reduce the average cost of production for American vessels, increasing profits. However, an influx of American effort to supplant the expelled foreign effort will reduce marginal catch rates and the catch differential, until eventually an equilibrium of catch rates recurs.

The benefit to American fishermen is the reduced average cost of production resulting from the FDZ, times tonnage landed. How much the average cost of production is reduced depends on what it would have been absent creation of the FDZ, and how much tonnage is landed by American vessels in the FDZ. The "opportunity catch" of American effort is difficult to identify, but it can be fixed within reasonable bounds. Given an opportunity catch level, tonnage landed in the FDZ can be predicted from the catch-effort model. Employing different estimates of opportunity catch and the catch-effort models for 1979-81, net benefits to harvesters from creation of the FDZ were estimated to range from $666,000 to $1,782,000. These are believed to be conservative because at every step in the analysis efforts were made to err on the low side; however, uncertainties in the quality of data used for estimation require that these estimates be considered only approximate, and indicative of the kinds of cost savings that could result to American harvesters because of increased catch rates.

Two adjustment effects are expected. First, there will be a redistribution of current groundfish effort into the zone, and it may include some vessels new to the groundfish fishery, for which the added returns from higher catch rates exceeds the opportunity costs of foregone earnings in other fisheries. Second, over the longer term, any increase in expected average catch resulting from a scarcity of available vessels (though unlikely) would make investment in new vessels more attractive.

The benefit which was presented is, necessarily, a short-term benefit; that is, it captures only the first adjustment just mentioned. It would not be expected to persist into perpetuity; rather, the redistribtuion of effort it stimulates or new investment which it attracts should serve to dissipate it. How long the adjustment process takes cannot be determined; what can be said, though, is that if the response mechanism is slow, the vessels which do fish FDZ waters will continue to receive a windfall. Because the benefits calculated in this analysis pertain only to the first adjustment to creation of the FDZ, they may be conservative.

Additionally, it should be reemphasized that only one of several potential sources of benefits to fishermen has been analyzed here. No attempt could be made to identify improvements in operating efficiency of American vessels which might result from reductions in crowding in FDZ waters. This would also be a short-term benefit, since American effort migrating to FDZ waters would at least partially offset the reduced foreign effort.

Very little information is available to infer what improved prospects (either in operating efficiency or catch rates) may result for cod fishermen from creation of the FDZ, since the only reported cod catches from that area are by-catches from foreign fleets targeting on pollock, and from limited U.S. joint venture operations targeting on Pacific cod in 1980 and 1982. Benefits similar to those accruing to pollock operations may result to cod fishermen; if this proves to be the case, the figures presented here are low estimates.

Accompanying the increase in domestic catch may be increases in incidental catch of prohibited species and domestic fixed-mobile gear conflicts. They probably will not be significant, since the model predicts that the increase

in catch will result from a reallocation of existing American effort. However, the FDZ is adjacent to the Bristol Bay Pot Sanctuary, and within the Halibut Winter Savings Area, so these species may be more concentrated in the FDZ area. Gear conflicts should be no worse in the FDZ area, since American trawlers communicate more easily with fixed gear fishermen than do foreign trawlers. Also, concentrations of effort in the trawl and crab fisheries occur at separate times without a great deal of overlap, so the FDZ should not aggravate any existing problems.

2. Processing Sector

Establishing the Fishery Development Zone could affect the ability of shore-based processors to compete with at-sea processors. Most at-sea processing is provided now by foreign processing vessels in joint ventures with U.S. vessels fishing for pollock. U.S. shore-based processors mainly are receiving Pacific cod.

If there were a shortage of catcher vessels, and active competition for their services, an increase in catch rates for pollock would make at-sea delivery relatively more attractive for harvesting vessels. Barring constraints on the daily quantities which a vessel can deliver, the catch rate increase would result in a larger increase in gross earnings to participants in joint ventures because more time can be spent fishing. Thus, the catch rate increase might force a shore-based processor to offer a higher price to his fishermen to compensate for the lower total catch which results, in part, from having to travel greater distances to deliver shore-side. Also, if the increase in catch rates were large or of substantial duration, it could impose disproportionately greater operating costs on fishermen who deliver to shore-based processors, because they handle the catch (in sorting, storing, and unloading) more than joint venture fishermen. If they were of any consequence, the shore-based delivery price would have to reflect the difference in these costs as well as the difference in fishing time.

Currently competition for the services of catcher vessels is not intense, nor is it expected to be in the near future, because of the generally distressed state of Alaska's shellfish fisheries. There is an abundance of qualified

crabber-trawlers with low opportunity cost (shellfish earnings) of groundfish fishing. Ex-vessel prices of groundfish reflect this excess supply as well as general groundfish market conditions. Therefore, short-term increases in catch rates for pollock and cod resulting from the creation of the FDZ probably will not force shore-based processors to increase their price to attract deliveries of product. Nevertheless, it is instructive to examine the effects of a catch rate increase on the price offered by shore-based processors under conditions of excess demand for catcher vessels, as a worst case scenario. This analysis, found in Appendix 3, shows that even in this remote circumstance, and (even less likely) if as much as 50% of the FDZ catch were purchased by shore-based processors, a net benefit of $298,000 would result.

C. Consumers

Creation of the FDZ should not affect retail prices for consumers. The amount of increase in the joint venture catch predicted by the 1981 catch-effort model ranged from 9 to 13% of the total actual US/JV catch for that year, and was only about 5 to 7% of the actual 1982 JV catch. Furthermore, JVs for the same years have accounted for a very small proportion (about 7 to 14%) of the total groundfish catch in the Bering Sea. The increased catch, therefore, represents less than 1% of the portion of world groundfish supply which comes from the Bering Sea. (Bering Sea groundfish catches represent about 3% of the world catch each year.) Therefore, no change in retail price could be expected to result.

D. Incidental Catch of Other Species

Trawl fisheries for bottomfish catch king crab, Tanner crab, salmon and halibut incidentally. These species are fully utilized by domestic fishermen and are prohibited species to all foreign fisheries. Retention of Tanner crab, king crab, salmon and halibut is also prohibited in domestic trawl fisheries.

If the foreign fisheries are excluded from the FDZ, they will have to change their historical fishing patterns. This may affect their incidental catch of

prohibited species. The Bering Sea time area closure model (Low et al. 1981) was used to analyze this question in the foreign fisheries. Based on the 1977-80 historical foreign fishing patterns the model predicted that if all foreign fisheries are removed from the FDZ, by-catches of halibut would remain about the same, decrease less than 1% for king crab, increase 3% for Tanner crab and increase about 10% for salmon.

There are two developments which affect how prohibited species by-catches in the foreign fishery will actually change. First, the U.S. groundfish harvest has been increasing rapidly, from about 39,000 mt in 1980 to 286,000 mt predicted for 1983. The increase in domestic harvest results in a direct reduction in groundfish available for foreign harvest and therefore, a reduction in the foreign by-catch of prohibited species.

Second, the Council has developed two amendments to control the foreign catch of prohibited species. One amendment established prohibited species catch limits (PSC) for salmon. The second amendment set PSC limits for all salmon and reduced the by-catch rate for king crab, Tanner crab and halibut.

Foreign fisheries have recognized that they must now reduce their catch of prohibited species. For example, NMFS reported that in 1982 incidence rates in the Bering Sea were generally lower compared to 1981, and that incidental catches of all groups of prohibited species in 1982 were less than in 1981. In addition, Japanese scientists have begun experiments to develop trawl gear which will further reduce the catch of prohibited species. Therefore, excluding foreign fisheries from the FDZ will probably not result in any significant increases in foreign by-catch of prohibited species.

However, as the domestic groundfish fisheries expand and replace the foreign fisheries, they will probably catch more prohibited species. If Amendment #6 accelerates the development of the domestic bottomfish fishery, the domestic by-catch of prohibited species can be expected to increase.

Currently there is little information on the extent of the prohibited species by-catch by domestic bottomfish fisheries for Pacific cod and pollock, the principle target species in the FDZ. U.S. observer information from the

U.S.-U.S.S.R. joint venture in 1980 and the U.S.-West German joint venture in 1982 indicates that when U.S. trawlers targeted on Pacific cod in the FDZ, their halibut incidental catch rate was 7.8 fish/mt in 1980 and 13.0 fish/mt in 1982. The Council's current policy is to encourage the development of the domestic bottomfish industry, to monitor the prohibited species by-catch, and to promote voluntary actions to keep the by-catch minimal. The Council's policy recognizes that government controls on the domestic industry would probably discourage development and that the need for such controls has not yet been clearly demonstrated.

E. Consequences for Other Areas Outside the FDZ

The benefits calculated in the preceding section can be expected to create a financial incentive for the domestic groundfish fishery to expand. Based on historical foreign catches in the FDZ, only between 6 and 10 American vessel-seasons would be required to duplicate the foreign harvest. Given that about 90 American vessels participated in the 1982 Bering Sea groundfish fishery, the potential impact on the American fleet of an increase of between 6 and 10 vessel-seasons would be minimal. The ports outside the FDZ which service the "new" vessels will undoubtedly appreciate new business, but the consequences of the new business should also be minimal.

There may be some significant beneficial consequences for the Dutch Harbor area which is outside, but very close to, the FDZ. Currently one processor is actively buying Pacific cod from American fishermen. Year-round operations in Dutch Harbor in the bottomfish industry will create a more stable employment outlook than the seasonal (and currently dismal) king and Tanner crab fisheries. In addition, fishermen currently working in the FDZ have reported conflicts with foreign factory trawlers which disrupted the supplies of fish to the shore-side plants. If the FDZ is in effect, this part of the supply problem should be solved.

IV. DESCRIPTION AND REGULATORY IMPACTS OF ALTERNATIVE ACTIONS

A. The Status Quo Alternative

The present analysis has identified a subsequent benefit to harvesters, in terms of increased catch rates and reduced cost of production, which should result from the creation of the FDZ. This may, if it persists into the future, provide an incentive for entry of new vessels, more vessels fishing other fisheries, into the groundfish fisheries. The increased catches resulting from the FDZ should not immediately cause any direct price competition between onshore and at-sea processors; however, this may occur with the start-up of at-sea cod processing. If the FDZ results in higher catch rates, some small increase in the price spread between onshore and at-sea processors may result. However, this may be compensated for by economies of scale and shore-side processing which can be realized with higher volumes of production. Consumers will be unaffected by this action.

If the FDZ is not adopted, the domestic industry in the Bering Sea will continue to grow. However, in the absence of any financial incentive such as that provided by the FDZ, the industry may be expected to continue languishing without the opportunity to search out and use the economies of scale which are so important to the high volume fisheries. Harvesters will be the group most affected by a lack of action, since the FDZ does provide the potential for an immediate improvement in their earnings.

There are no benefits to American interests which would be realized by this course of action, so in light of the costs (in terms of foregone opportunties) which this alternative bears, the Council rejected this alternative as inferior to the implementation of the FDZ regulation.

B. The Larger Area Alternative

Under this alternative the FDZ would be defined so as to encompass a larger area. This alternative would make more groundfish available to U.S. fishermen in a larger area without competition from foreign fleets. Foreign catches from 1978 through 1980 in this area averaged 40% greater for pollock and 36% greater for Pacific cod than in the proposed FDZ.

A larger FDZ could result in greater benefits to the U.S. groundfish industry than those already described. The data used for the analysis of the change in catch rates and benefits therefrom is only applicable to the proposed FDZ, therefore it is not possible to quantify the benefits from a larger area at this time.

A larger area should not significantly affect the ability of the foreign fishery to catch its allocations assuming that the economics of foreign harvesting is not a binding constraint. The Bering Sea time-area closure model (Low, et al. 1981) indicated that no nation would be in serious danger of a premature closure of its entire fishery due to an early achievement of a quota species, and that based on 1977 to 1980 average catches, about 11% of the foreign groundfish catch would have to be taken in the remaining open areas.

A larger area could affect the foreign incidental catch of prohibited species. An analysis of a larger area considered by the Council using the Bering Sea time-area closure model (Low et al. 1981) predicted that based on 1977-80 historical data by-catches would decrease by 1% for halibut, increase by 2% and 5% for king crab and Tanner crab, respectively, and increase by 20% for salmon.

Written and verbal testimony presented to the Council indicated that the proposed FDZ was adequate for the purposes of enhancing the development of domestic groundfish fisheries. Therefore, the Council considered a larger FDZ to be unnecessary.

V. POLICY CONSIDERATIONS

A. Introduction

The United State's policy of encouraging development of the bottomfish resources off Alaska is clearly stated in the Magnuson Fishery Conservation and Management Act. This policy is also manifested in other laws and in rather substantial amounts of money either coming from the U.S. Treasury, from

deferred taxes, from fish import duties, or through U.S. government guaranteed loans. The total money spent, committed, or guaranteed easily exceeds $100 million to date, and this commitment can be expected to increase in the future. It is appropriate that this RIR/IRFA should, in addition to demonstrating the benefits of the Fishery Development Zone, demonstrate the extent of the government's commitment to bottomfish development.

B. The Magnuson Act

The Magnuson Act states in two places that developing bottomfish resources off Alaska is a national goal. Section 2 states:

(a) FINDINGS

(7) A national program for the development of fisheires which are underutilized or not utilized by the United States fishing industry, including bottomfish off Alaska, is necessary... .

(b) PURPOSES

(6) to encourage the development by the United States fishing industry of fisheries which are currently underutilized or not utilized by United States fishermen, including bottomfish off Alaska, and to that end ensure that optimum yield determinations promote such development.

Other parts of the Magnuson Act are specifically designed to benefit the U.S. fisherman and his exploitation of Alaskan bottomfish resources. Some examples of this are the priority given to DAH over TALFF, and the definition of OY which should be set to provide the greatest overall benefit to the nation. That the above provisions may not suffice and that other measures, e.g., the Fishery Development Zone, may be needed is evidenced in Section 303, Contents of Fishery Management Plans. There are specific references to the effect that FMPs may contain provisions which, "...designate zones where, and periods when, fishing shall... be permitted only by specified types of fishing vessels...," in this case United States fishing vessels.

C. The Merchant Marine Act of 1936, Title VI, The Capital Construction Fund

Under the Capital Construction program, the U.S. government allows fishermen to establish accounts for the replacement of vessels, construction of additional vessels, or reconstruction of vessels, built and documented in the United States. Generally, amounts of money deposited in a CCF account are deferred from Federal taxation. If withdrawals are made for capital investments in fishing vessels to be used in fisheries not designated as "conditional," the basis of the vessel, for future tax purposes, is substantially reduced.

The Secretary of Commerce has designated certain fisheries as conditional which are overutilized or overcapitalized. Bottomfish off Alaska obviously is nowhere near being so designated. Therefore, on the west coast a strong financial incentive exists for fishermen to invest in the Alaskan bottomfish fishery. Currently about $50 million is deposited in CCF accounts from vessel earnings obtained in Alaskan fishing operations. Although these earnings are from traditional species (salmon, crab, shrimp), future use of much of those funds is likely to be in Alaskan bottomfish.

D. The Merchant Marine Act of 1936, Title XI, The Fishing Obligation Guarantee Program

Under the Title XI program, the U.S. government will guarantee loans from private institutions to the fishing industry for amounts up to 87.5% of the cost of constructing, reconstructing, reconditioning or purchasing fishing vessels and for fisheries shore-side facilities. The vessel or facility must be used in a fishery not designated as conditional for the loan guarantee to apply.

This authority has been used in three ways to support the development of the Alaska bottomfish industry: (1) to guarantee the construction and reconstruction of vessels which intend to fish primarily on bottomfish; (2) to guarantee the construction costs of converting vessels originally built for king crab,

shrimp, etc., for bottomfish trawling; and (3) to guarantee the construction or refinancing of facilities which are or will process Alaska's bottomfish resource.

The National Marine Fisheries Service estimates that $20 million in loan guarantees is currently outstanding for the construction or reconstruction of vessels to fish in the Alaska bottomfish or opilio Tanner crab (when that was underutilized) fisheries; that $17 million in guarantees will be provided over the next 18 months for vessels to convert to bottomfish trawling. Additionally, $10.5 million in loan guarantees are likely to be approved for two shore-side facilities which will process Alaskan bottomfish. Thus, the total U.S. government commitment to guarantee loans for utilization of Alaskan bottomfish will amount to nearly $47.5 million.

E. The Saltonstall-Kennedy Act, 15 USC Section 713c-3

The Saltonstall-Kennedy Act dedicated 30% of the revenues collected on import duties of fishery products to development of the U.S. fishing industry, through grants for development projects and research. The law now specifically states that persons eligible to receive S-K monies shall include any development foundation or private non-profit corporation located in Alaska.

National Marine Fisheries Service regulations to implement the Saltonstall-Kennedy program established the following regional priority for Alaska:

> 5. Alaska Region: Species to be given highest priority for development and utilization in Alaska include Alaska pollock, Pacific cod, Atka mackerel, and the various flounder species. Priority will be given to projects which address the complete use and final distribution of products in order to obtain the highest value for landed species... . (47 FR 4212, et seq.)

The National Marine Fisheries Service reports that since 1979, about $6 million in S-K funds have been spent or committed to Alaskan projects, and over 90% of this has been for bottomfish development. It is anticipated that up to $1.7 million will be invested in the model whitefish demonstration project on Akutan Island, adjacent to the FDZ, by the end of 1983.

APPENDIX 1

EXAMPLE OF BENEFITS FROM IMPROVED CATCH RATES AND OPERATING EFFICIENCY

Table A-1 shows the effects of increases in catch rate and operating efficiency on harvesting economics. First, catch per unit effort is assumed to increase by 0.3 mt/hour, or roughly 8%, with no change in operating efficiency; and, second, it is assumed to remain constant while operating efficiency (defined as hours fished per day) increases by 0.6 hr or about 6%.

When catch per unit effort is increased, the only additional costs to the owner are higher crew payments, which are tied to gross earnings. In this example, labor costs increase by $20,199 as catch rate rises and produces additional gross earnings of $55,261. With no change in effort, the non-labor costs remain the same, and therefore the owner realizes a net cash flow of $100,491, or a $35,062 increase over the base case. Including the increased labor payments, which is also a benefit of the increase in catch rates, the total increase in net benefits resulting from a higher catch rate is $55,261. Therefore, if catch rates increase due to imposition of the FDZ, any increase in gross earnings will result in an identical increase in net benefits.

In contrast, increasing the operating efficiency increases the proportion of time spent fishing and probably the variable non-labor costs as well, due mainly to additional fuel costs and gear maintenance costs. Jaeger (1977) estimated daily fuel consumption for each of the major activities involved in bottomfishing (fishing, running to and from port, and down time in port or on the grounds). If these consumption rates are applied to both Jaeger's and Army Corps' estimated proportion of the season spent in each activity, slightly <u>less</u> fuel is required for a fishing day than for a non-fishing day; therefore, fuel costs would be expected to decrease slightly as operating efficiency increases. Both authors assume that gear maintenance and replacement cost is proportional to effort, and therefore would increase as operating efficiency increased. In this example, the additional gear replacement costs would outweigh the fuel cost savings. Therefore, increased operating efficiency causes variable non-labor costs (and thus total non-labor costs) to increase by $15,328 over the base case.

In addition to the increased costs of operation are increased labor costs that rise in proportion to the increased gross earnings. The total costs thus increase by $26,337 compared to the base case and the gross earnings increase by $40,576 due to the higher operating efficiency (more hours trawled per day). The owner's increased net cash flow ($14,239) and the crew's pay increase ($11,009) combine to give $25,248 in net benefits resulting from increased operating efficiency. Thus, in this example, increased efficiency had about half the effect of increased catch rate on net benefits resulting from implementing an FDZ.

TABLE A-1. Expected Impacts of Changes in Catch Rates or Increases in Operating Efficiency on Harvest Economics of a "Typical" Vessel

	Base Case	Catch Rate Increases: to 41 mt/day	Operating Efficiency Increases: to 10.6 hrs/day
Fishing Days	151	151	151
Hours Trawled Per Day	10	10	10.6
Catch Per Hour Trawled	3.8	4.1	3.8
GROSS EARNINGS	763,808	819,069	804,384
(Expendables)	(178,369)	(178,369)	(189,000)
COSTS OF OPERATION			
Non-labor Costs:			
Fixed	228,837	228,837	228,837
Variable	257,167	257,167	272,495
TOTAL NON-LABOR COSTS	486,004	486,004	501,332
LABOR PAYMENTS:	212,375	232,574	223,384
TOTAL COSTS	698,379	718,578	724,716
NET CASH FLOW	65,429	100,491	79,667
Δ LABOR PAYMENTS	-------	20,199	11,009
Δ NET CASH FLOW	-------	35,062	14,239
Δ NET BENEFITS	-------	55,261	25,248
Δ GROSS EARNINGS	-------	55,261	40,576

APPENDIX 2

ANALYSIS OF MEAN CATCH RATES INSIDE AND OUTSIDE THE FDZ IN 1979 AND 1980

The FDZ ecompasses the heavily fished 100-fathom curve in the Southeastern Bering Sea (Figures A-2a and A-2b). This area has been fished intensively for pollock by Japan, Korea, Poland, the U.S.S.R., West Germany and Taiwan. Very high catch rates (over 90 metric tons per hour trawled) have been recorded from the FDZ, but mean catch rates generally are similar to those observed in surrounding waters.

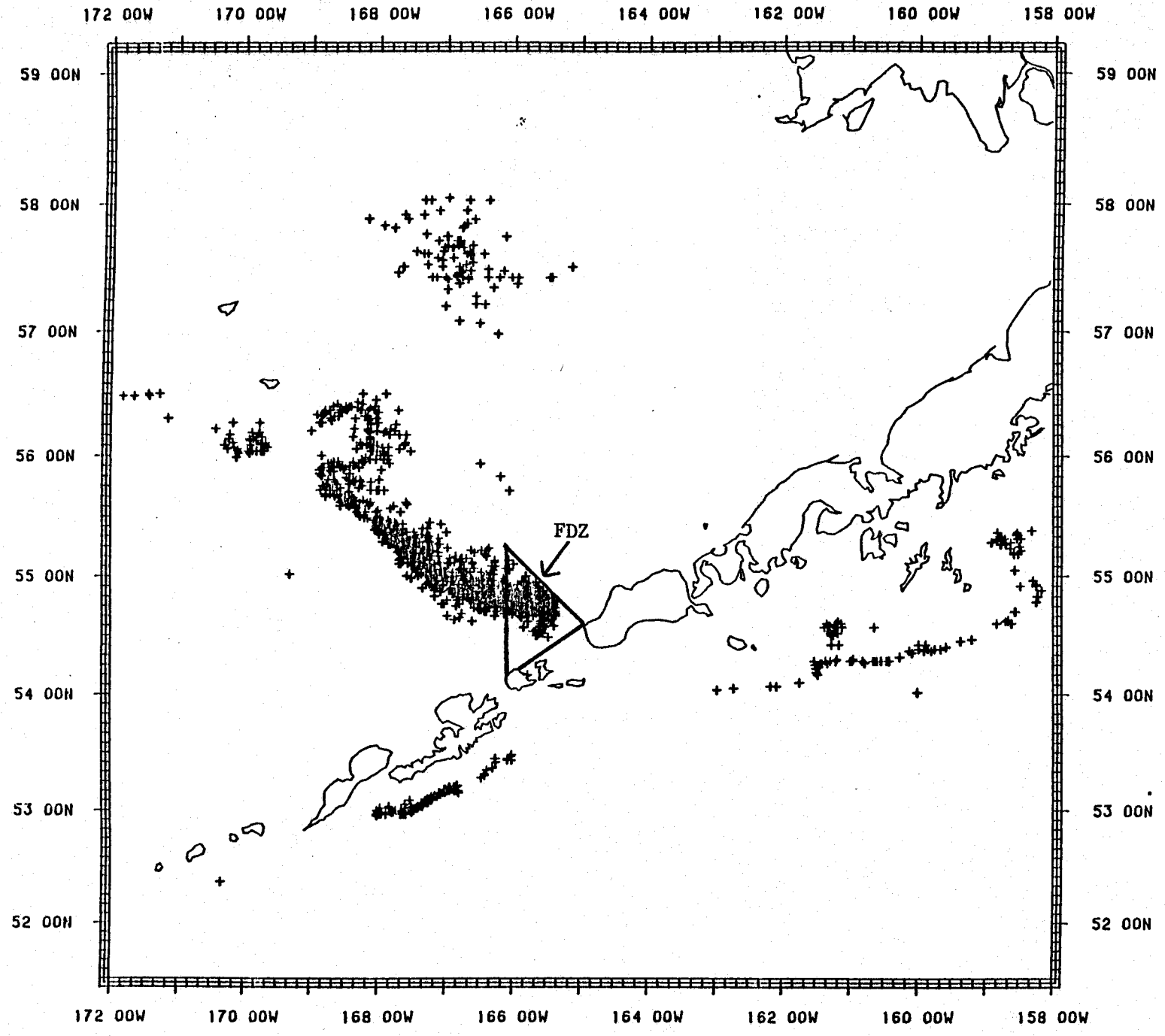
To test whether catch rates in the FDZ differ significantly from those in surrounding waters, catch rates from Smith et al. (1981) for the most productive tows of the foreign fleet in 1979 and 1980 were compared by location and season. Mean catch rates for pollock varied seasonally but were not significantly different by location (Table A-2a). Pacific cod catch rates also varied seasonally but were not significantly different inside the FDZ compared to surrounding waters (Table A-2b).

It should be noted that the cod catches were all by-catch by fleets targetting on pollock, so that catch rates reported by the foreign fleets, while as high in the FDZ as elsewhere, are probably substantially lower than would be expected by a fleet targetting on cod; this has been borne out by the limited American experience with joint ventures for cod.

The practical significance of the creation of the FDZ is that a portion of the very richest foreign fishing grounds in the eastern Bering Sea is to be reserved for harvests by the domestic fleet. The evidence available from the foreign fishery does not appear to support the assertion that catch rates have historically been higher in the FDZ than elsewhere, even though some stock surveys have indicated greater relative abundances. (Neither, of course, is the assertion that catch rates are lower supported.) Yet, the area encompassed by the FDZ is the most logical choice for such a zone since it is the part of the historically rich grounds closest to shore-side processing and support services. This close access reduces costs of production compared to equal areas further distant. For shore-side delivery of catch, transit time

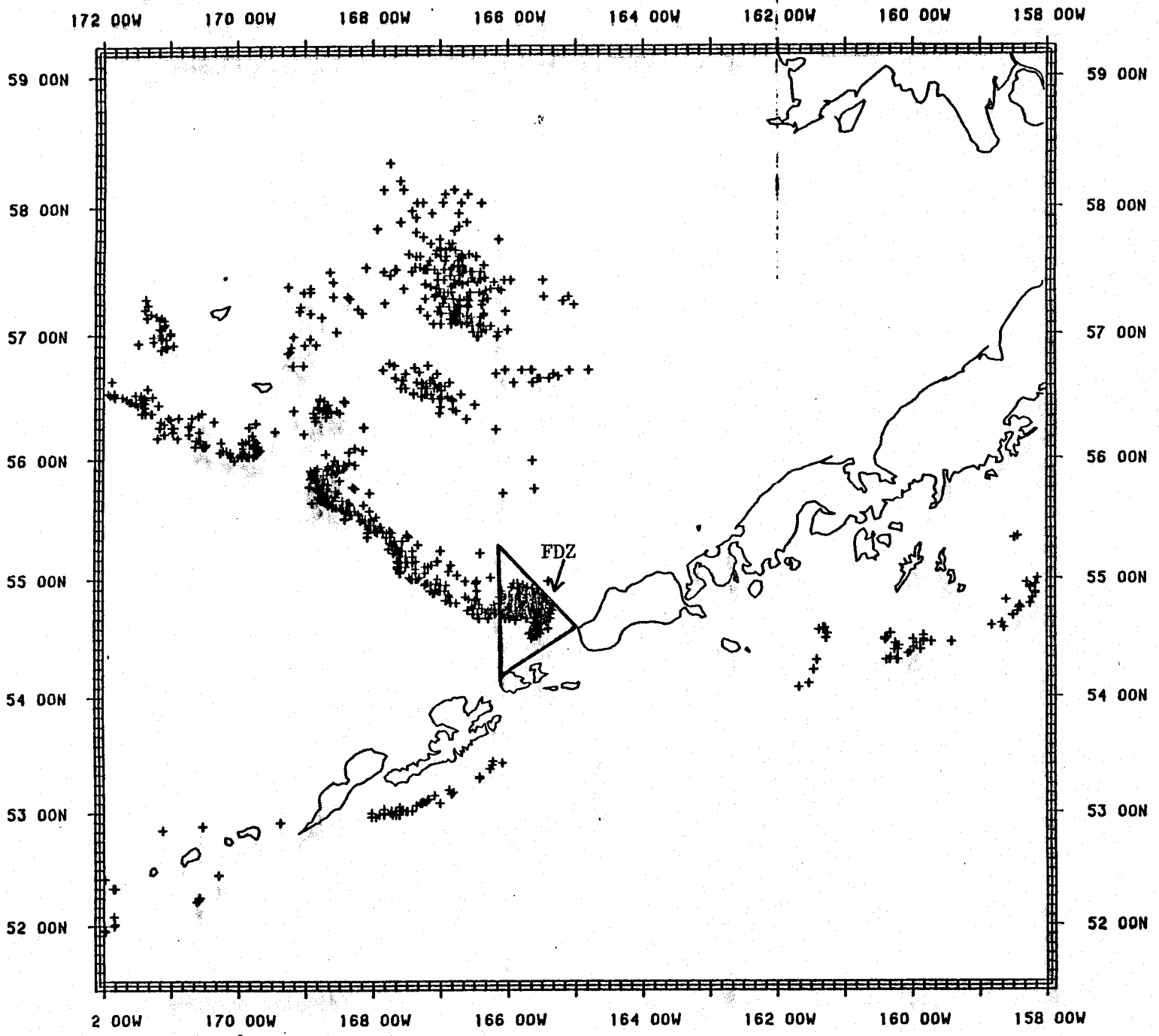
to the fishing grounds is reduced, permitting an increased ratio of fishing days to operating days. Though the difference will be smaller for at-sea delivery of catch, proximity of fishing grounds to port will shorten transit times for resupply and crew rotation.

FIGURE A-2a. The Most Productive Foreign Trawling Locations for Pollock in the Southeastern Bering Sea, July - September of 1979 and 1980[a/]



Source: Smith et al (1981)

FIGURE A-2b. The Most Productive Foreign Trawling Locations for Pacific Cod[a] in the Southeastern Bering Sea: All months, 1979 and 1980[b]



Source: Smith et al (1981)

a/ Virtually all cod catches reported here were incidentally caught (i.e., not in directed fisheries)

b/ Each "+" denotes a productive trawl location. CEs graphed here ranged from 0.227 to 10.18 mt/hr trawled.

TABLE A-2a. Foreign Catch Rates for Pollock in 1979 and 1980 for Inside and Outside the FDZ[a/]

Period	Statistic	Catch Rate(mt/hr trawled) Inside FDZ	Outside FDZ
Jan. 1 - March 31[b/]	mean	*	2.05
	standard deviation	*	2.60
	number of trawls	*	218
April 1 - June 30[b/]	mean	7.53	8.85
	standard deviation	4.05	6.48
	number of trawls	27	243
July 1 - Sept. 30	mean	22.61	23.09
	standard deviation	12.72	10.65
	number of trawls	105	165
Oct. 1 - Dec. 31[b/]	mean	15.05	14.3
	standard deviation	13.39	9.18
	number of trawls	94	176

Source: Smith et al. (1981)

a/ These comparisons should be considered approximate for three reasons. First, it was not possible to separate out the effects of different vessel classes on catch rates. Second, this is a summary only of the most productive tows, and it is possible that there were large differences in the less productive tows which are not reflected here. Third, there was some variation in duration of tow and these are simple averages.

b/ The FDZ is part of the Winter Halibut Savings Area which is closed to foreign trawling December 1 - May 31. Therefore, there is no foreign harvest in the zone in the first quarter, it occurs only in June in the second quarter, and only in October and November in the fourth quarter.

TABLE A-2b. Foreign Catch Rates for Pacific Cod[a/] in 1979 and 1980 for Inside and Outside the FDZ[b/]

Period	Statistic	Catch Rate(mt/hr trawled) Inside FDZ	Outside FDZ
Jan 1 - Mar 31[c/]	mean	--	0.55
	standard deviation	--	0.642
	number of trawls	--	115
Apr 1 - June 30[c/]	mean	0.74	0.57
	standard deviation	0.70	0.48
	number of trawls	38	195
July 1 - Sept 30	mean	1.08	0.89
	standard deviation	0.80	0.88
	number of trawls	101	169
Oct 1 - Dec 31[c/]	mean	0.83	0.71
	standard deviation	0.53	0.97
	number of trawls	78	192

Source: Smith et al. (1981)

a/ Virtually all (91%) of these catches were reported in tows where they were by-catch -- that is, total pounds of cod were less than that of some other species (usually pollock).

b/ These comparisons should be considered approximate for three reasons. First, it was not possible to separate out the effects of different vessel classes on catch rates. Second, this is a summary only of the most productive tows, and it is possible that there were large differences in the less productive tows which are not reflected here. Third, there was some variation in duration of tow and these are simple averages.

c/ The FDZ is part of the Winter Halibut Savings Area which is closed to foreign trawling December 1 - May 31. Therefore, there is no foreign harvest in the zone in the first quarter, it occurs only in June in the second quarter, and only in October and November in the fourth quarter.

APPENDIX 3

EFFECTS OF INCREASED CATCH RATES ON THE PRICE PREMIUM OFFERED BY SHORE-BASED PROCESSORS

Several authors [see, e.g., Jaeger (1977), Philbin (1978), Lynde (1980)] have pointed out that at-sea delivery of product offers several economies to fishermen when compared to delivery to shore-side plants. The advantages arise primarily from two sources. First, transit time between the processors and the fishing grounds is less, which shortens the trip cycle[1/] and permits more fishing days per season. Fuel costs may vary somewhat between the two modes as a result of the transit time difference, as may certain other costs (e.g., the need for buying and carrying ice may be eliminated if delivery is at sea). The second major advantage is a potential reduction in crew size for at-sea delivery, since transfering codends directly to the mothership eliminates the need for on-deck sorting of marketable and unmarketable catch.

These economies in the catcher operations lead to a two-tiered price structure in ex-vessel markets where at-sea and shore-based processors compete for the services of a limited number of catcher boats. This may become important as at-sea processing for cod develops.[2/] The premium paid for shore-side deliveries may be affected by any increase in catch rates resulting from the creation of the FDZ.

This question can be addressed by examining the simple mechanics of pricing in ex-vessel markets where at-sea and shore-based processors compete for raw product. At-sea processors offer harvesters the advantage of shorter turn-around time and can be viewed as price leaders. Shore-based processors are price followers and must react to the price set by at-sea processors by paying a premium to attract deliveries. The shore-side price must permit the

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1/ travel to grounds, fishing, return to port, and off-loading/resupply

2/ Having to pay a premium for raw inputs places shore-based processors at a competitive disadvantage in output markets where their product competes with at-sea produced product purchased for a lower input price.

harvester to attain net revenues at least as great as for at-sea deliveries; at the margin, that price will permit equal net revenues. This condition can be expressed mathematically as:

$$P_{as} \cdot Q_{as}(1\text{-}crew_{as})\text{-}MCOSTS_{as}\text{-}OCOSTS = P_{sb} \cdot Q_{sb}(1\text{-}crew_{sb})\text{-}MCOSTS_{sb}\text{-}OCOSTS \qquad (1)$$

where P_{as} and P_{sb} refer to the ex-vessel prices offered by at-sea and shore-based processors; Q_{as} and Q_{sb} refer to the quantities of fish landed in each delivery mode; $crew_{as}$ and $crew_{sb}$ refer to the total payment to the crew[3/] (proportion of gross earnings) in each mode. The term (1-crew) represents the proportion of gross earnings which the owner receives, and from which the non-labor costs of operation must be paid.[4/]

The non-labor costs of operation have, for convenience, been divided into two categories: MCOSTS, or costs which are affected by choice of delivery mode (such as ice and fuel), and OCOSTS, or costs which are unaffected by choice of delivery mode (such as insurance payments). Notice that the distinction does not necessarily have to be between fixed costs and variable costs, although variable costs may be most likely affected by choice of delivery mode.

The first case to be considered is one in which the price structure is determined at some base level of catch rates, the second where catch rates are increased. Choice of delivery mode will not affect catch rate, but will determine the number of days spent fishing (which will be greater for the at-sea processing mode). Let D_{as} and D_{sb} represent the number of days which can be fished by the harvesting boat in each of the delivery modes; then:

$$Q_{as} = \frac{D_{as}}{D_{sb}} \cdot Q_{sb} \qquad (2)$$

3/ Total payment to the crew embodies two factors which may be affected by choice of delivery mode: number of crew employed and crew share per person. The discussion here depends on the aggregate figure, total payments to crew.

4/ The reader will recognize that a gross stock method of dividing gross revenues is employed here. Some owners deduct certain costs before crew shares are determined, but the same basic principles apply regardless of how crew share is determined. For brevity in exposition, the gross stock method is assumed throughout the discussion.

Equation (2) is a rewritten version of the identity that catch rates, i.e., total season catch divided by total number of days fished, are the same for the vessel regardless of delivery mode.

For convenience, $crew_{as}$ can be expressed in terms of $crew_{sb}$:

$$crew_{as} = crew_{sb} - d_1 \tag{3}$$

where d_1 is a general term which explains the difference in total payments to crew in each of the two delivery modes. From the earlier discussion, $d_1 \geq 0$. Similarly, $MCOSTS_{as}$ can be expressed in terms of $MCOSTS_{sb}$:

$$MCOSTS_{as} = MCOSTS_{sb} - d_2 \tag{4}$$

where d_2 is a general term explaining the differences in non-labor costs between the two delivery modes. The term d_2 could be positive, negative, or zero.

Using equations (2) through (4) to substitute into equation (1) for Q_{as}, $crew_{as}$, and $MCOSTS_{as}$, and rearranging (1) to solve for P_{sb}, P_{sb} can be expressed as follows:

$$P_{sb} = \frac{D_{as}}{D_{sb}} P_{as} \left(1 + \frac{d_1}{1-crew_{sb}}\right) + \frac{d_2}{Q_{sb}\ (1-crew_{sb})} \tag{5}$$

Equation (5) identifies the price a shore-based processor would have to offer to attract deliveries from catcher boats. It has three terms, which correspond to the effects of the advantages enjoyed by at-sea processors. The first, $(D_{as}/D_{sb})P_{as}$, accounts for the increased number of fishing days possible with at-sea deliveries; the second, $\left(d_1/(1-crew_{sb})\right)(D_{as}/D_{sb})P_{as}$, identifies the effect of any difference in labor costs (total payments to crew); the third term $\left(d_2/Q_{sb}(1-crew_{sb})\right)$ explains the effect of differences in non-labor costs.

It should be stressed that there <u>will</u> be a difference in number of days fished between delivery modes, while there <u>may</u> (or may not) be differences in labor

and non-labor costs. The general formulation of (5) permits the identification of effects of cost differences in the two modes, if any exist, and the effect that increased catch rates may have on the price premium paid by shore-based processors.

The exclusion of foreign fisheries from the FDZ will probably result in a short-term increase in catch rates for U.S. vessels (see Section III.B.1.). As a result of this increase, the total days spent fishing in the season (D_{sb}) will decline in the shore-based delivery mode, since it takes less time to "plug" the holds with a full catch. Each trip cycle will take less time, and the proportion of time actually spent fishing in the trip cycle will decline. Total days spent fishing in the at-sea mode (D_{as}) should be unaffected by catch rate changes, since hold capacity is not a constraint in at-sea delivery. 5/ Thus, the spread in catch and gross earnings between the two delivery modes should increase as catch rates increase. This increase in gross earnings differential may increase the premium paid by shore-based processors.

Direct competition between shore-based and at-sea processors for the services of catcher boats, if it ever occurs, will probably occur first in the Pacific cod fishery. However, little information is available on directed fishing for cod in the FDZ, while there is more data on the directed pollock fishery. Thus, the effect of increasing catch rates on the price differential will be examined using pollock data, recognizing that there will not be any such price competition in the near future, and that the magnitude of change in the ex-vessel price differential with respect to catch rate changes may be analyzed.

In a very simple model, the proportion of time spent fishing during the groundfish season can be identified as the proportion of time fished on a single trip:

5/ Even though vessel hold capacity is not a constraint, net capacity and processing capacity may be. Thus, assuming that D_{as} does not decline is quite conservative since it probably overstates the difference in days fished.

$$\frac{D_{sb}}{S} = \frac{d_{sb}}{d_{sb} + tt_{sb}} \qquad (6)$$

where S is the length of the groundfish season, in days; d_{sb} is the amount of time spent fishing, and tt_{sb} is the amount of time spent not fishing (transit time, offloading, etc.), for a single trip, and D_{sb} is as defined previously. This simple formulation assumes that each vessel trip is identical to all others. If catch rate, rather than product quality, is assumed to limit days spent fishing on each trip, then

$$d_{sb} = \frac{HOLD}{CPUE}, \qquad (7)$$

where HOLD is the vessel's hold capacity, and CPUE is the daily catch rate. In words, the length of time spent fishing on a single trip is constrained by the hold capacity, and the higher the catch rate, the less time it takes to "plug" the hold. Substituting (7) into (6) and rewriting obtains:

$$D_{sb} = \frac{(S)(HOLD)}{HOLD + (CPUE)(tt_{sb})} \qquad (8)$$

As was developed in Section III.B.1., under one model 42,515 mt of groundfish will be caught at an average catch rate of 50.6 mt/day if the FDZ is created, compared with a rate of 40.5 mt/day in the absence of the FDZ. Jaeger (1977) estimates that a 120' vessel has a hold capacity of 162-181 mt of groundfish. Using 150 mt as a fleet average capacity, 180 operating days in the groundfish season, and two days for non-fishing time per trip (the farthest point in the FDZ for shore-based processing is about 70 miles, or less than 9 hours running time), D_{sb} = 117 days if CPUE in equation (8) is 40.5 mt/day. When CPUE increases to 50.6 mt/day, D_{sb} drops to 107 days, though total season catch increases by 675 mt, from 4,739 mt to 5,414 mt.

The effect of increased catch rate on the difference in price paid for shore-based versus at-sea deliveries can be determined by using D_{sb} from equation (8) and P_{sb} from equation (5). Non-labor costs are assumed not to

vary with delivery mode, and therefore, $d_2 = 0$.[6/] Also, d_1 and $crew_{sb}$ are assumed not to vary with increased catch rate because it will be temporary. Under these conditions, the difference, P', between at-sea and shore-based prices is:

$$P' = P_{sb} - P_{as} = P_{as}\left(\frac{D_{as}}{D_{sb}}\left(1 + \frac{d_1}{1\text{-}crew_{sb}}\right) - 1\right) \qquad (9)$$

This expression can be evaluated most easily by assuming that a joint venture trawler delivering at-sea maintains its capability to deliver ashore by retaining enough crew for either type of operation. Then, $d_1 = 0$ and P' is directly related to the ratio, D_{as}/D_{sb}. Recall that joint venture vessels fish about 151 days (D_{as}) of 180 operating days in the groundfish season, independent of catch rate. Shore-based vessels, as shown above, will fish for 117 days at a catch rate of 40.5 mt/day, and 107 days at 50.6 mt/day. If joint venture prices are \$132/mt (about 6 cents per pound), then shore-based processors will need to pay \$171/mt at 40.5 mt/day and \$187/mt at 50.6 mt/day. Thus, if the creation of the FDZ increases catch rates by 25%, the price premium paid by shore-based processors will increase by \$16/mt.

Since the assumption that $d_1 = 0$ is somewhat unlikely, we can approximate (9) better if we assume that the difference in crew requirements between delivery modes is one man, and his share is 7% of gross earnings. For a crew of five delivering shore-side, total labor payments would be about 40%. Thus, (9) simplifies to

$$P' = P_{sb} - P_{as} = P_{as}\left(1.12\,\frac{D_{as}}{sb} - 1\right) \qquad (10)$$

The increase in price premium associated with an increase in catch rates from 40.5 to 50.6 mt/day is approximately \$18/mt.

6/ For approximation of the effects, this is reasonable, since (as mentioned earlier) the changes in non-labor costs would be partially offsetting. Note that this is a conservative assumption, since the right hand term in (5) decreases as catch rate increases, because catch (Q_{sb}) increases.

In this worst case, the gains to harvesters (of about $16/mt for the full FDZ catch) are partially offset by losses to shore-side processors, which are about $18/mt for the proportion of FDZ catch which they purchase. If, for example, shore-side processors purchased 50% of the FDZ catch, the net gain to the fishing industry would be $16/mt - (0.5)($18/mt) = $7/mt. Thus, even in the unlikely event that competition for catcher vessels in the pollock fishery arises in the near future, the gains to fishermen will more than offset any possible losses to shore-based processors.